

## IBM to Maintain Extended 30s Under 'Best Efforts' Contract

By E. Drake Lundell Jr.

Of the CW Staff

SAN FRANCISCO — Users of extended core memory equipment apparently are now assured of continued IBM maintenance on their 360/30 CPUs despite earlier IBM threats to withdraw such maintenance [CW, March 15].

IBM last week guaranteed to provide such maintenance on a "best efforts" basis as part of a "stipulated judgment" between it, Advanced Memory Systems (AMS) and IteI that resolved the AMS, IteI antitrust suit against IBM.

While the court settlement, entered in the U.S. District Court for the Northern District of California here, only requires IBM to continue maintenance of users with AMS equipment, legal sources said IBM would prob-

ably have to extend the same treatment to users of other extended memory equipment.

Officially, however, IBM only said "it would discuss its relationships with other memory manufacturers on an individual basis" and that it hoped to develop "a consistent policy" in this area.

Under the agreement IBM has agreed to configure its diagnostics to run on 360/30 CPUs with extended memory up to 96K or 128K. Previously, IBM had said it was impossible to run its diagnostics on 30s with extended memory.

Secondly, it agreed to add documentation on the wiring necessary for a 96K machine to the manuals used by its customer engineers.

At the same time, however, IBM will not add the documen-

tation needed by customer engineers to understand the wiring of a 128K machine, even though it is offered by IteI, AMS and other manufacturers.

Under the third part of the agreement, if an IBM CE decides there is a problem he cannot correct in either the AMS extended memory or in the altered portion of the CPU, he must tell the user where the problem is.

### Call In a CE

In such cases, the user would call IteI and explain where the problem was. IteI would call in a customer engineer from Comma Corp. to correct the problem under its normal contract to maintain the AMS memory — at no extra charge to the user.

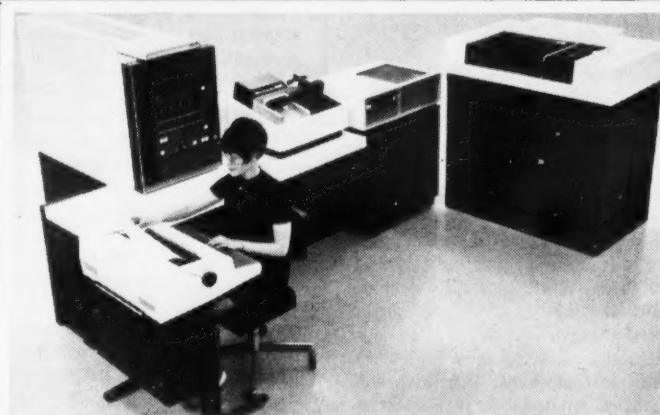
Computer Investors Group, which markets extended memories manufactured by Data Recall, said it has always had a policy of reimbursing users for extra maintenance charges that were due to the installation of Data Recall equipment.

In addition to the stipulated settlement in the court, three letters relating to extended memory passed between IBM, IteI and AMS last week.

In the first, AMS informed IBM it would redesign the interface on its extended memories so that the memory beyond the IBM 64K limit on the 360/30 could be bypassed and IBM CEs could run the 64K diagnostics without any problem.

In the second letter, IBM assured IteI it had inspected 360/30, 40, 50 and 65 CPUs with AMS memories that do not go beyond the IBM limits and has found them acceptable. It also said it had inspected a

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A typical configuration of the Memorex MRX/40.

## Distributed System First of New Breed

By Frank Piasta

Of the CW Staff

SANTA CLARA, Calif. — The long advocated concept of distributed processing now may be realized in a small business-oriented system in the first Memorex series of computers.

The principle applied to the new series will result in a tremendously powerful I/O processor, according to a company official.

The Memorex computers are designed to appeal to 360/20 users, offering prices and performance between the IBM System/3 and the 370/135.

Memorex models MRX/40 and MRX/50 feature multiprocessor architecture, cycle times as fast as 800 nsec and hardware compatibility with all IBM peripherals.

A writable control store that can be modified by the user provides an instruction set to include the user's subroutines.

The architecture of the system incorporates eight processors, four for I/O control, three for

the user programs and one for the operating system. All processors share the system main memory and the ALU (arithmetic-logical unit) data path.

Of the three user-designated processors, two are being used to run programs simultaneously, with one reserved for future use.

Each of the four I/O processors is dedicated to one of the following functions: disk storage control, communications control, card reader, reader/punch control and channel control.

The eighth processor has the overall control of the system.

A limited amount of compatibility with the 360 Series is built into the Memorex systems. Both models offer 360/20 emulation. The software is compatible, Memorex said, at the source level, and the operating system, which requires at least 8K, is functionally similar to IBM DOS.

The MRX/40 is available with from 16K to 64K bytes of storage. Cycle time for non-memory references is 1.6  $\mu$ sec, with mem-

(Continued on Page 5)

## Exemptions May Reduce New Calif. Software Tax

By a CW Staff Writer

LOS ANGELES — The Los Angeles and Orange County assessors have issued guidelines for the treatment of software as tangible personal property for tax purposes and most other county assessors are planning to follow suit.

Users, however, may never have to pay the tax, since a bill pending in the California legislature exempts most programs from the tax roles.

"All of the county assessors are planning to levy a tax on software," a source close to the California Assembly's Revenue and Tax Committee said last week.

The bill, sponsored by assemblyman Joe A. Gonsalves (D-La Marada), would allow the counties to tax the medium on which the programs were written — the tapes, disks or cards, at their face value — but it would exempt the programs themselves

from tax as intangible property.

There is some confusion over the bill, since it defines software as the actual tapes, disks or cards, and defines programs as the instructions contained on those tapes, disks or cards.

The guidelines issued by the Los Angeles County Assessor may well become the model for other areas planning to levy software tax, sources said.

Generally, the assessor said, software should be reported much the same way as computer hardware is for tax purposes.

A spokesman in the office of Assessor Phillip E. Watson said the tax on software is a logical extension of unbundling.

"Before unbundling," he said, "we collected taxes on the user's entire computer bill, which paid for hardware and software. Now that software is a separate item on the bill, there is no reason that it should be exempt from the tax."

### What Is Covered?

Users will have to pay tax, under the new guidelines, on all software developed or purchased, according to the assessor's office.

The user will treat rented, leased, loaned or consigned software the same way he treats other personal property in those classifications, the assessor's office said.

Not covered by the tax will be maintenance of software programs, the office said. However, it warned, "this does not include major overhaul of programs."

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### Micr Coding Forged

## DP System Accepts Counterfeit Checks

RENO, Nev. — A Magnetic Ink Character Recognition (Micr) imprinter is aiding crime here.

The unit has been used to imprint correct Micr code on four phony checks passed here recently — all of which cleared the bank without any problem since it does not examine the checks manually, but just reads the Micr code at the bottom, police said.

The four checks — the only ones found so far — all carried the correct code for a major airline, police said. Ranging in value from between \$20 and \$300, they all were passed here and cleared by a San Francisco bank.

The counterfeit was discovered only when a clerk at the airlines went through the checks manually and discovered that the four differed slightly in color from the other checks used by the airline.

No other checks have been found here, but there are probably more of the same type being passed in Northern California, according to Sgt. Abe Feroah of the Reno Police Department.

He said the checks were of "poorer" quality than those usually used by the airlines but this was probably not picked up by the two casinos, the department store and bank which cashed them because the coun-

terfeiters "probably hit them while they were busy."

Other police sources said it could not be determined how many of the bogus checks were in circulation because few companies "manually check every returned payroll check after it has been cleared by the bank."

"And it appears that the banks are not checking the cleared checks as long as the Micr identification matches the one expected."

"For all we know these guys could have the correct identification numbers for several businesses which have not yet caught on to the counterfeits."



## Software From Abroad

## Strong Foreign Challenge May Fill IBM-Made Vacuum

By Alan Taylor

When IBM prevents maximum utilization of its computers by withholding hardware and software improvements from the market, and when it tries to prevent the independent vendors from supplying these improvements, as it did in the case of extended core memories, it creates a situation which could hurt the U.S. computer industry.

Because, when the users become aware of inefficiencies and want improvements, they will take them from any source. Foreign companies, marketing to IBM's U.S. customers in this IBM-created improvement vacuum, could form a formidable challenge to U.S. computer supremacy.

So the question is not whether the independent vendors will survive but whether the successful challengers will come from Grand Rapids, Mich., or Woola Woola, Australia.

Because of capital requirements and other problems, foreign hardware is not now a threat. Foreign software is another matter.

In 1965, when IBM engineers were developing the controller for the then new IBM 2314 disk drives, they found they could hardwire the logic. But, they also found that if they did, the manufacturing cost would be higher than the cost of making a 360/30 central processor. So they abandoned the hardwired approach in favor of microprogrammed controllers which, in fact, were stripped down and reprogrammed Model 30s.

## 1/2 in. Tape Revolution

Later, the use of microprogrammed controllers spread to computer tape systems, but the user still was not offered the opportunity to use the full capabilities of these controllers. The tape controllers, for instance, could have been used to support a complete revolution in 1/2 in. tape handling.

They could have provided users with the much wanted write-in-place tape systems, or with automated tape systems, or even with joint tape/disk installations. If the users had known how

## CW Investigative Report

IBM's current dispute with the independent vendors of extended core has overtones that affect not only users of IBM machines, but also equipment manufacturers and even the whole U.S. computer industry.

This is the third in a series of reports on the effects of IBM's attempt to withdraw maintenance from 360/30 users with memories extended to 128K.

flexible the controllers were, they would almost certainly have been used in this way — and the users' investment in tape and disk drives would have been preserved as the controllers were constantly reprogrammed to keep up with the latest techniques.

This did not happen. The techniques involved are certainly being developed, but instead of being made available for the current generations of computer hardware, they are apparently being held back until they can be associated exclusively with some new hardware — such as a new set of 3 in.-wide tape systems.

When potential improvements are kept from current equipment, and only provided to users of brand new equipment, it certainly helps the marketing of the new equipment. The buyer often does not have to compare the value of the two pieces of hardware, but simply the value of the new technique itself. Where the technique is valuable, the new hardware can be sold almost without regard to price, provided the technique is available only to individuals with the new hardware.

What happens then is that an area of inefficiency is created between the older product — which has not been kept up to date — and the new product which does include provision for all the latest techniques. The broader this inefficiency area, the stronger will be the urge among users to move up to the latest hardware, and the less cost will be involved in marketing the new generation of equipment.

The creation of such areas of inefficiency does take time, however. Technical progress on a product has to be halted for

between two and four years before a sufficiently wide inefficiency area will push users to a new generation. And a lot can happen in those two to four years.

What happens next, so far as IBM equipment is concerned, is that the whole civilized world becomes aware of the inefficiency — and that nothing substantial is being done to halt it, or to significantly reduce it.

## Software Blossoms

As a result of this proclamation of continuing inefficiency, with the implied later announcement of a new product, the software area blossoms. A software package aimed at the inefficiency can be produced, marketed and funded effectively even though a hardware product cannot be, because of relatively low capital investment required.

So, the price of helping to sell new generations of hardware by restricting new techniques to the new hardware will include the creation of markets for software. And, unlike hardware manufacture where the facilities of the U.S. are still the most powerful, software manufacture can take place anywhere in the world where computers are available.

In fact, curiously, it appears that people outside the U.S. stand a better than average chance of hitting the jackpot with systems software. This is because they have to match and beat the IBM product in their own backyard before thinking of marketing in the U.S. And when they do consider the U.S., they realize they will have to meet and beat the best the U.S. software producers can supply. So they upgrade their product to beat the U.S. software industry

as well as IBM products. By contrast, no such compelling need to improve faces the U.S. product, which can always find plenty of prospects who only know the IBM offerings.

This is not an idle hypothesis. It has already happened. When development of the IBM DOS system practically stopped in 1968, an Australian named Boyd Munroe started work on the design of an efficiency aid for DOS users. Now, after being refined twice as it approached the U.K. and U.S. markets, the aid has around 400 sales and is one of the most successful software products in existence. And, as long as DOS users are around, it will continue to sell. With a pencil and some idle computer time as an academic exercise, Munroe has made a well-funded industry of his own — and can get Australian backers for his production of new products even if he runs out of the dollars that the U.S. market is earning for him.

After such a success, do you expect him to lie down and do nothing else? Or do you expect him to be looking over the 370s now in Australia, for their weak points? Is there anything to stop him or other such people in Australia or other countries? The money markets in other countries may be smaller than ours,

but they can support the small needs of software development.

Compare this with the situation in the U.S., with the money market frightened of IBM's next move, with technicians accustomed to permitting their work to be pigeonholed, not because it isn't marketable but because it is so marketable that it could upset IBM's plans for another round of product changes.

It is possible, of course, that new products will grow in such rocky soil. But the situation away from the IBM shadow, where the developer is looked on by all as an asset, will be a lot more fruitful in producing the new leadership technology.

The IBM action in attacking the oversized memory installations has virtually extended the improvement vacuum over most of the U.S. financial market, and so over most of the independent computer manufacturers here. As a result, it will most likely intensify the probability of foreign leadership springing up to bring all computer users into better use of their hardware, thus endangering the whole U.S. industry's position.

The only question remaining is whether the eventual outcome of the recent dispute between IBM and the memory manufacturers will lift this threat — or intensify it.

## IBM to Maintain Extended Core 30s

(Continued from Page 1)

360/22 CPU with 64K, which is beyond IBM limits, and found it acceptable to continued maintenance.

Computer Investors Group also reported IBM had cleared its installations with memory within the IBM limits for 30s, 40s, 50s and 65s and a 360/22 installation that was expanded to 64K.

The IBM move to service 360/30 CPUs may force it to revise some of its maintenance contracts with users, since the present contracts require IBM to replace a CPU if it is not able to correct the machine.

But before IBM can alter any of its contracts, it agreed, in the third letter, to give ITEL advanced

notice of the changes.

If ITEL does not feel the changes are fair to users, it can go back to court and ask the judge for a ruling before IBM can make the contract changes.

In addition, if ITEL brings out new products that go beyond the standard memory sizes, the court would have to rule on withdrawal of maintenance before IBM could take any action in that direction.

As part of the settlement, AMS and ITEL agreed to drop their anti-trust suit against IBM.

The agreement was approved by Judge Lloyd Burke, but the court retained jurisdiction in the case to make sure that the terms of that settlement are obeyed.

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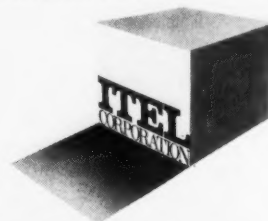
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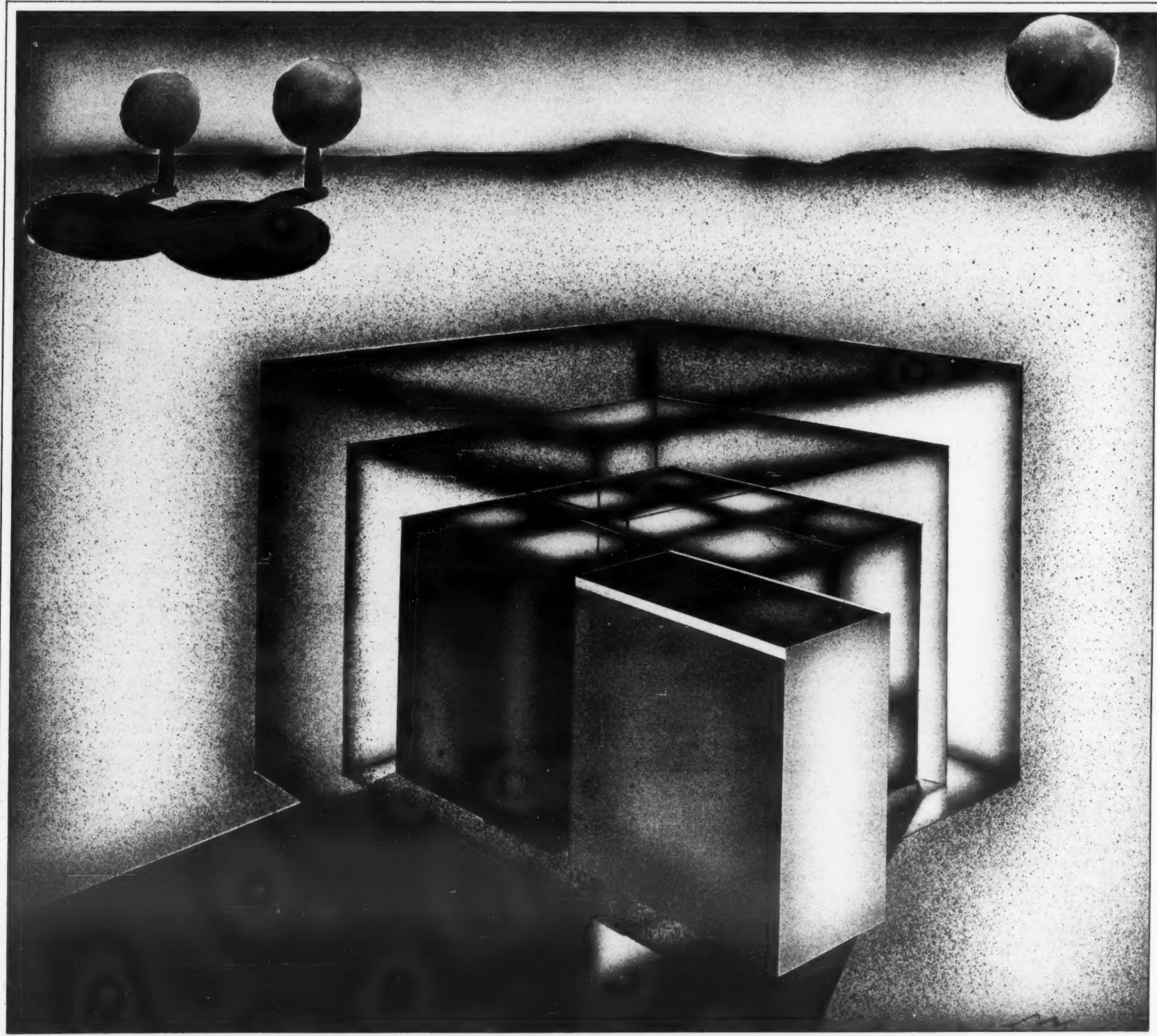
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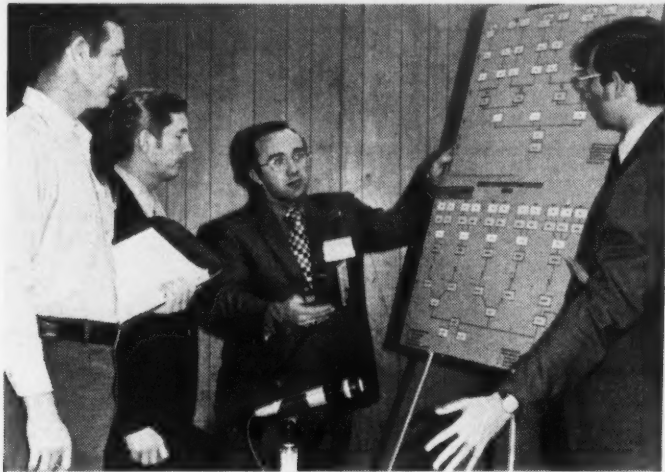
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After the workshop, users inspect Blue Cross/Blue Shield direct data entry system and communications lines to computers. The system, using 167 remote terminals, is explained to (left to right) William Davidson, of Texas Instruments, and Milford Springfield, of William Cameron & Co., by Gregg LeMaster and David Taylor.

## CW Southwestern Users' Forum

# Users Like Accuracy of OCR

DALLAS — Rejects are "something you live with" when using OCR equipment, and must be considered along with other factors before choosing OCR, according to Hank Biasini, vice-president of operations at the Southwestern States Bankcard Association (SSBA) here.

Whether the reject rate is 2% or 30% is largely a function of the application and the users, but not the equipment itself, he told his OCR workshop during the Southwestern Computer Users' Forum and Exposition.

Typing on OCR forms can yield an extremely low reject

rate, he related, adding "we get upset when it gets over 7%." But hand-printed forms or credit card receipts that go through a mechanical imprinting device

### First Day

may experience higher reject rates, perhaps as high as 20%, without disastrous results, he added.

SSBA, which processes Master Charge accounts for 495 regional banks, uses key-to-disk equipment to handle the rejects.

Despite the high cost of using on-line data entry, there are certain benefits and advantages, one of which includes increased keying speeds, said Gregg LeMaster of Blue Cross/Blue Shield. He told attendees at his direct data entry workshop that keystrokes were now averaging 12,000/hr, higher than when the operators were counting their own strokes during the keypunch days.

Another advantage, he indicated, was the varying size of records. Responding to a question on record size entered into the system, LeMaster commented that the operators "fill the screen." It is a "free format," he indicated, and operators sometimes have to fill the screen two or three times to enter one complete document.

Dr. Dick B. Simmons of Texas A&M told his intelligent terminals workshop there really is no excuse for using conventional keypunching when a minicomputer-based "intelligent" terminal effectively costs less than a keypunch machine. The only thing preventing wider use of

programmable terminals is a very definite software gap.

The software gap exists primarily for those users who wish to have more than data entry capabilities, since that basic application is often provided by vendors of the terminals. Even though the mini makers have begun to recognize the end-user, the industry's long dependence on the OEM market was blamed for the lack of generally useful software.

It's fairly easy to tell when a user should consider switching from conventional keypunching to a better mode of data entry, according to Norman Abdellah of Zale Corp. at the keypunch replacement workshop but the choice of what to use as a keypunch replacement should not be made casually.

The importance of looking at several alternatives was emphasized by panelist Dave Abright of Sears Roebuck, who joined Abdellah in the workshop session. Sears looked at key-to-tape systems before it went key-to-disk, but the software for the tape-based system just wasn't good enough, Abright said.

With its changeover from conventional keypunching, Sears has now increased its data entry productivity by 25% to 30%, at less cost, but the company had a longer learning period than it had anticipated to get to the current level, he added.

Zale rejected the key-to-tape concept, because it didn't like the tape pooling required before the data could be entered into the company's mainframe for processing.



Incoterm SPD 10/20 Intelligent CRT (CW Photos by E.J. Bride)

## ...Coping With Independent Carriers

DALLAS — Data transmission among several independent carriers, such as the midwest and far western telephone companies, can present special problems for users, according to

### Second Day

Computerworld Forum panelist Ron Winkler, of Executive Control Systems here.

Winkler's company performs the computing functions for Sky Chef, the food subsidiary of American Airlines, so he has

considerable backing despite his relatively small size.

In transmitting data over a dial network between Denver and Dallas, there can be trouble in "interfacing the two carriers." The phone system in Denver "does not recognize transmission failure," he told his workshop attendees. If a call is not complete, "we have to phone them on a second circuit," and tell the user at the opposite end to reset the modem, he related.

Data transmission at 9,600 baud can be "feasible" and desirable, even though remote sites are as distant as 1,000 miles, according to Frank Huessner, of Agency Records Control Inc. (ARC), of Houston.

ARC serves several different insurance companies from its computer center in Bryan, about 100 miles away.

With large volumes of data being processed late in the month, Huessner preferred the 9,600 baud rate, with independent modems. "We are working to cut turnaround time," and eventually go on-line, he related.

Roy Allen, the city's DP director, told his workshop on private networks that the city of Dallas tended to overdesign its teleprocessing networks at the same time that it underestimated its traffic. The traffic load jumped from 22,000 inquiries a day last summer to 33,000 daily now. It

is expected to grow to 40,000 a day later this year, he noted.

To support this workload, Dallas has stayed with hardware from IBM, running all the tele-

### L.A. Next Stop

The conference visits Los Angeles next week (April 4-6), and San Francisco the following week (April 10-12).

processing on a 256K 360/50 operating under DOS. The city has been using IBM 2260 CRTs and 2740 hard-copy terminals, but has now begun to replace the 2260s with Courier 1920 CRTs, as a result of a reevaluation during which Allen's department considered 10 different units.

Any DP installation operating on a charge-back, non-profit basis must be willing to go to independents for hardware and software support if it means a better product for the same cost or the same type of product at less cost, according to Wallis McMath of Texas A&M.

To illustrate his point, panelist McMath told the second-day audience at the CW Forum that his center uses an IBM 360/50 and largely IBM terminals, but nearly everything in between is from independents. This includes Ampex bulk storage, Telex tape drives, Memorex controller and modems from Rixon, Teltech, GE and Prentice, he said.

## Mini Links May Cause More Coordination Problems

DALLAS — Using many minis may cost less than using a single centralized mainframe, but will probably cause many coordination problems, for both people and programs, according to panelist Robert Wells, vice-president of Medical Information Inc. (MII).

Personnel costs, for local programmers to work with the scattered minis, may be just as high as for a staff to serve the bigger machine, Wells said.

Even linking large-scale CPUs, with each having a particular purpose, can cause problems, Wells noted. MII moved from duplexed 360/40s to a combination of one 40 dedicated to teleprocessing, tied to a 370/145 to handle batch processing. Unfortunately, the 40 couldn't get at the disk files on the 145, because of the speed of the 145.

The problem was solved by inserting "2,000 to 3,000 instructions that didn't do anything" but kept control of the 145 long enough so that the 40 and the 145 could work to-

### Third Day

gether. In effect, the company made the 145 work as if it were a duplexed 40.

Henry Atchison of the Federal Reserve Bank told his workshop on system software that software available from IBM isn't always good enough to use. He noted that his installation is using IBM's Customer Information Control System (Cics) for its teleprocessing work, but it had to be adapted to handle Fortran for the bank's research staff to improve restart capabilities.

Various operations were built around a Bunker-Ramo controller and BR terminals, and Cics had to be adapted to work with these units as well as IBM's equipment, he added.

In his comments on Cobol, Atchison said Cobol can be used as long as users know how to define jobs and dispatch priorities, and as long as they avoid excessive recompilations.

Service and performance problems using independent peripheral equipment are not as significant as many users think, according to panelist Gene Tuttle, vice-president of the Fort Worth National Bank.

Speaking to attendees at an operational efficiency workshop, Tuttle said his installation had received "good support" from all five vendors in his center.

He also complimented the sup-

port independent vendors can give to the IBM side of the house, citing a problem with IBM software. "After IBM had given up," he related, "our independent technical representative found the problem and recommended the fix" which solved it.

Robert G. Worthy, of Bell Helicopter told his workshop, "we did everything IBM told us not to do" in an effort to "get more things going in our CPU."

The advice he disregarded included leasing his CPU from a third party ("IBM still has the maintenance"), adding core, and using other independent peripherals.

A study had shown Bell's CPU was active only 40% to 50% of the time, he noted, and the answer to this inefficiency was to make the processor busier.

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Second-class postage paid at Chicago, Ill. Published weekly (except: a single combined issue for the last week in December and first week in January) by Computerworld, Inc., 25 E. Chestnut St., Chicago, Ill. 60611. © 1972 by Computerworld, Inc.

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**Lawyers Told****Potential of Computer Searches 'Great'**

By Edward J. Bride  
Of the CW Staff

ATLANTA — Acceptance and use of computers by lawyers represent "the most significant happening" to the legal profession "in at least the last 100 years," members of the American Bar Association (ABA) were told here recently.

Even so, because of the size of investments needed to develop information systems, "a way must be found for the public sector and the private sector to share data bases and computer programs."

The speaker was Carl S. Mallow Jr., of the office of the Judge Advocate General, U.S. Air Force. Mallow is one of the pioneers of Legal Information Through Electronics (Lite), a full text information retrieval service offered to government users by the Air Force.

While the use of computers by lawyers is increasing, the "great potential" for the future is using computers "during the course of trial, where time is of the essence," Mallow commented.

"The thoroughness of computer searching will be of great assistance in the writing and study of briefs upon appeal," he added.

Mallow was one of about two dozen speakers at the ABA's first National Conference on Automated Law Research, conducted at the Georgia Institute of Technology.

The most significant use of computers by lawyers comes in the areas of searching stored information on legal decisions or law, to find "precedents" in litigation, speakers indicated.

But when the outcome of legal proceedings is at issue, electronic legal research should be provided to the legal profession "only through the organized bar," according to Robert Asman, president of the Ohio State Bar Automated Retrieval System (Obar).

Charles E. Tidwell, who helped install a computer-aided typing system in the Georgia General Assembly, noted "anyone who deals with a great volume of text" should be interested in systems "which would help manipulate that text."

Advocating the use of computer technology in helping to write and edit legislation, as well as retrieve it, Tidwell advised the lawyers to establish strong business relationships with all technicians who might possibly get involved in setting up such a system: hardware experts, software types, consultants, facilities managers and any others.

Jerome S. Rubin, president of Mead

Data Central, Inc. (MDC), which operates the computers for Obar, said the use of fast CRT terminals enhanced interactive research capacity and "dramatically confirmed the practicability of computerized legal research."

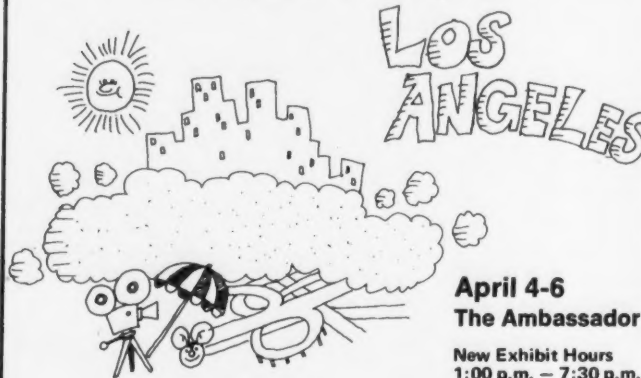
Over the last two-and-a-half years, "rigorous control" has been maintained over the Obar program, to permit strict observation of user behavior and careful analysis of system operation, Rubin reported.

Lawyers have reported to MDC, Rubin continued, that learning to use computers "is already considerably easier than learning to use the traditional, hierarchical subject matter indices of manual research."

"An extraordinary relationship," he continued, "is that between man and the machine." Despite their "notorious reputation for conservatism," he explained, lawyers have now shown "a surprising readiness to break with the tradition-encrusted techniques of manual research" and to "embrace the technocratic."

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**NASHUA**

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(Continued from Page 1)

ory reference cycle taking 1.8  $\mu$ sec.

The MRX/50 offers twice the performance with non-memory reference times of 800 nsec and memory reference cycles taking 900 nsec. Memory is available in capacities from 16K to 128K bytes.

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## Superior Court Gets Calif. Theft Case

LOS ANGELES — Jerry Neal Schneider, a communications equipment firm president who was arrested for allegedly stealing nearly \$1 million worth of Pacific Telephone Co. supplies by cracking the code for the company's computerized

### News Wrapup

order system [CW, Feb. 16], has been bound over to Superior Court.

Schneider, 21, is charged with multiple counts of receiving stolen property and grand theft.

He was arrested Feb. 8 by investigators who said his firm, Los Angeles Telephone and Telegraph Co., was used to order the equipment.

### Central Welfare Registry Urged

NEW YORK — The state welfare inspector has recommended the creation of a central registry that would keep a computerized record of every welfare recipient in the state.

In a series of recommendations for tightening the accountability of the welfare system, George Ber-

linger called the welfare administration "so characterized by staff incompetence, inefficiency and disinterest that abuses within the system abound."

Berlinger said the central registry would hold a file of all recipients in the state now on the rolls of local districts.

### Just Who Does He Think He Is?

NEW CONCORD, Ohio — A college sophomore enrolled in Computer Science and programming courses at Muskingum College has found an error in an economics textbook by Paul Samuelson, winner of the Nobel Prize.

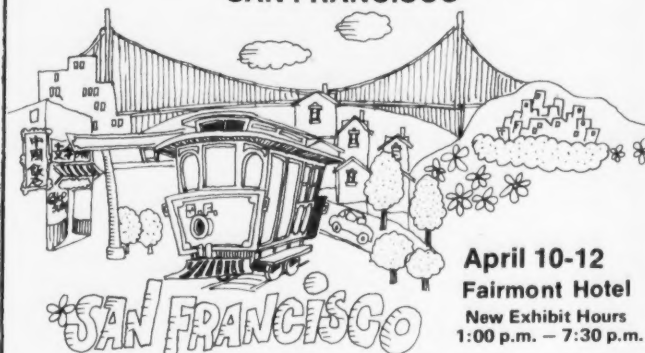
Albert Hill found the error while checking out material on his college computer. The error persisted through five editions of the text used in most college economics classes.

The textbook said that in the process of multiple deposit expansion by a series of banks, all but one cent of the full effect of the deposit expansion from an initial deposit of \$1,000 would be realized within 25 generations of expansion.

Hill used the computer to find that it would require 59 generations for bank expansion to reach this limit.

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### City 'Finds,' Loses \$106,000

SAN MARINO, Calif. — A computer "error" has cost this city \$106,000 in taxes.

The city's computer made no mistake, but the city mistakenly collected taxes on a computer outside of its jurisdiction.

The city collected \$106,000 in sales taxes on a computer in nearby Pasadena and now has to return the money to that city.

If the statute of limitations had not run out, the city would have owed Pasadena another \$74,000 in taxes collected on the computer over two years ago.

### That Cough May Cost More

NEW YORK — Federal authorities are expected to feed into computers the company records of two North Carolina mail order shippers to find New York residents who bought mail order cigarettes from the firms without paying state and local taxes.

A state tax official said 100,000 cigarette shipments were involved but the number of individual buyers had not yet been determined.

### Mailman Job May Be Easier

WASHINGTON, D.C. — The U.S. Postal Service plans to experiment with a new type of computer-assisted address-change system which would assure fast, legible and accurate addressing for forwarded mail.

The test may lead to nationwide elimination of the mailman's job of manually revising the addresses of mail to be forwarded. Printed, pressure-sensitive address labels are used.

At Charlottesville, Va., the post office has a link to a computer in the Washington headquarters which determines whether a piece of mail can be forwarded, and if so, provides the correct address label.

### Yale Looks At DP Talent

NEW HAVEN, Conn. — Yale University freshman hopefuls now can submit paintings, essays, musical compositions, science projects or computer programs as part of a new applications process.

According to admissions committee officials, the new practice will help to evaluate better the interests and abilities of the candidates.

### Missing Comet Found

PHOENIX — After having vanished for 93 years Tempel I has been found.

The missing comet eluded astronomers since its last sighting in 1879.

But Dr. Elizabeth Roemer of the University of Arizona used a computer to figure the next time Tempel should return on its orbit. The calculations were correct and she was able to photograph the comet.

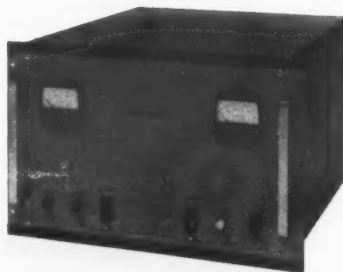
# Face it. There are only three things you can do when the ac power fails:

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If you'd like to hear how it'll back up your operation call Wally Foy collect, (714) 279-0800, 8159 Engineer Road, San Diego, California 92111. After all, swearing at the power company is silly, and playing with matches in the dark can be dangerous.

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## Editorials

### 'DP Error' Not a Defense

For convenience, we teach employees and program computers to take certain actions when input is missing. The specified action all too often is to have the person or machine assume that so-and-so is true if no contrary data is provided.

With human employees, there is at least a chance that disaster will be prevented because some human "senses" something is wrong and decides not to make the usual assumption.

But, unless the programming makes specific provision for it, a computer will never "sense" something is wrong and will always make the assumption that so-and-so is true.

Not only can companies be held responsible for assumptions made by their employees, but, according to Judge J. Murrah of the Tenth Circuit Court of Appeals in Denver, companies can be held responsible for assumptions made by their computers [CW, March 22].

How many assumptions is your computer making every day?

### Ghost-Written Programs

If a college student buys a term paper instead of writing it himself, he probably has not done his education a great deal of harm. Most occupations don't require the type of research and writing that is learned from such school projects. Though the student has missed a chance to learn something that might be useful to him, the major objection to the practice is that cheating is more than a minor form of dishonesty.

But when a computer sciences student buys computer programs instead of writing them [CW, March 22], he may be affecting his future ability to carry out the responsibilities of a job in the computer field. He is not only a dishonest person, he may also be becoming an incompetent person.

We don't want such people in the computer community.

Authorities have begun a crackdown on the term paper racket. We urge that laws also be passed to make it illegal to either buy or sell computer programs for such fraudulent purposes.



'It's beyond me, but I'll get my ghost on it right away.'

## Letters to the Editor

### 'What's Good for IBM Not Good' for User

IBM has been aggressively marketing the outright purchase of 370/155s and 165s. A recent article on IBM in *Fortune* indicates the 370 line will be completely obsolete in five years. It indicates the 165 and 155 models were announced on the basis of demands of the marketing force rather than the knowledge and technology advancement indicated by engineering and product development.

It appears that the purchasers of 370/155s and 165s will be financing the IBM fourth generation of computer systems and profit growth demanded by the stagnant 6% increase in rental business in the U.S.

It appears that IBM is offering obsolete equipment for outright purchase and aggressively selling it to customers. It is clear from the article that IBM software will take up considerably larger amounts of memory than presently announced and require cycle times that core memory machines cannot meet in the future to support such applications on a time increment basis.

Our company, being in the used computer business, looks at this particular approach by IBM as being self-serving rather than satisfying the low percentage of outright sales that have been historically made to end users for 360 generation equipment.

Again, it appears that what's good for IBM is not good for the customer, and what is good for the customer is not good for IBM. To have customers paying enormous sums of money for outright purchase for equipment that has such a short life cycle reflects directly on the ethics of the world's largest uncontrolled monopoly.

George S. McLaughlin Jr.

GSM  
Summit, N.J.

### Clarification Offered On SS Number Use

In a letter Feb. 23, the writer quoted the editor of *Govern-*

ment Data Systems on the use of the Social Security number for identification in part as follows: "The inclusion of the Social Security number is, without doubt, a violation of federal statutes." I think it would be helpful to clarify the situation as it exists.

The use of the Social Security number by non-federal government organizations as an identifier or recordkeeping device is neither authorized nor approved by the Social Security Administration. However, there is no provision in the Social Security Act or in any other federal statute or regulation that prohibits such use.

In testifying before the Senate Subcommittee on Constitutional Rights on March 15, 1971, Secretary of Health, Education, and Welfare Richardson made it quite clear that use of the Social Security number by non-federal organizations is neither illegal nor, in itself, an invasion of privacy, since the number reveals no information about the person to whom it is assigned, nor does the Social Security Administration release any confidential information from its files to individuals and organizations that may be using the number for non-program or non-federal purposes.

Jack S. Futterman  
Assistant Commissioner  
for Administration

Department of Health,  
Education and Welfare  
Social Security Administration  
Baltimore, Md.

### How to Reduce Keys For Arab Typesetting

In reference to Joseph Hanlon's letter [CW, March 8] on Arab typesetting:

Hanlon is in a sense quite correct. The large and vigorous output of newspapers and periodicals in Arabic and Persian has been made possible only by the use of semi-automated typesetting systems. Even the mechanical typewriter can be used (there does not seem to be a standard electric for this), and I have myself fallen back on that to

provide a master for offset printing.

But the fonts used for such systems do a certain amount of violence to the shape of Arabic script characters, and few readers of Arabic think of them as intrinsically desirable.

There is, moreover, one basic difficulty in all these existing systems, that is made obvious by the reference to a 280-character keyboard. A system that requires 200-odd keys for a mere 35 (Arabic) or 40 (Persian) basic letter values is in trouble.

One of the chief benefits of the system I am working on is that it will stick firmly to the restriction: one basic letter = one key = one binary code value. That is even simpler, and less conducive to error than any of the existing models of Arabic script typewriter.

Pierre A. MacKay  
University of Washington  
Seattle, Wash.

### Writing Sans Ring

The Special Report of March 8 quotes Mike Murphy of Tel-ex - "there's no way that a tape transport can write on that tape" when the write ring is removed.

This is just not so. It would be so if absence of a write ring physically disconnected the heads rather than "logically" disconnecting the heads.

Power failures or surges can often cause a tape without a ring in it to be written on. The microswitches used to sense the write ring can often be jammed or "tricked" by the operator, and when they fail mechanically, they often fail in the "write" position.

It is time this misconception is cleared up and the equipment made to perform as it should.

N.A. Brown  
E. Eisner

Bellaire, Texas

Preference will be given to letters of 150 words or less. Letters should be addressed to: Editor, Computerworld, 797 Washington St., Newton, Mass. 02160.





## Enter Furr Challenge Cup Contest

# Can Your DP School Meet a Challenge to Excellence?

Data processing schools are lately much suspect as to their quality. Few graduates boast that they come from XYZ School, (the way they might if they came from Yale), and many DP school graduates like to forget where they got their training, so bad is the feeling on this subject.

### The Taylor Report

By Alan Taylor, CDP



The graduates like to have others think they had no formal training, which is a bit ridiculous.

Yet, when you start looking, you find the DP school graduates working throughout the profession — and successfully, too. They are not being automatically pushed aside when one of the university computer science graduates arrives on the scene. They normally continue in real professional work. So it appears that the picture is somewhat biased.

#### Good Achievements Also

Now there is an opportunity to show the other side of the coin — the good that the DP

schools do, how well they serve their students, the DP technology, society — and what holds them back from doing more.

And in showing how well they do, instead of being thought of as simply indulging in commercial boasting, they will be seen performing the real function for which they have been created — DP education.

#### A Furr Initiative

This has happened simply because one person, Cole Furr, principal of Coleman College in San Diego, had the initiative (audacity? guts? foolhardiness?) to stand up and proclaim, "we are the best data processing school in the country." He started the ball rolling, and it was then picked up by his faculty, his students and his graduates.

#### Active Alumni

The graduates got involved because they have a very active alumni association. It is quite widespread, because over the past eight years graduates have increased, but there are still many in San Diego so that the college can boast a third of the local DP managers were trained at Coleman. The graduates have monthly meetings, and when they heard about Furr's chal-

lenge, they picked out their role — to provide a trophy to the winner, and to arrange for its award.

The trophy, reasonably enough, is named after the man who started the ball rolling with his challenge, and so it is called the Furr Challenge Cup. And it will go to the school that most shows its worth before July 1.

I don't know, but I suspect that Cole actually does not want to win the trophy himself. I think he really wants to be beaten by some school from Rhode Island, or Indiana — which he would never have heard of if he had not put out his challenge.

I think he suspects this is the simplest way to find out some new ideas — and you know — he's quite right. In fact, any school taking the challenge can expect to reap major benefits just from the interchange of data, and the reconsiderations which will inevitably occur. So everybody gains, and this is excellent.

#### Cup Rules

The first rules of the competition are in the accompanying box. The entrants should contact Paul E. Salcido, Fotomat Corp., 920 Kline St., La Jolla, Calif., 92037 for details. Salcido is the president of the alumni

### How to Enter Furr Challenge Cup Contest

1. The competition is open to any data processing school in the U.S. Whether the school is public or private, or whether it is solely dedicated to data processing or not, is no matter.

2. The school can be represented by its administration, its current students or its alumni. These may work together or produce separate entries.

3. The Furr Challenge Cup will be awarded to the school which most proves it is the best data processing school in the country before the closing date for entries (July 1, 1972).

4. An entry should contain five separate reports showing the quality of the school's work, and the problems that are hindering its further improvement of quality. The reports should be entitled:

"How XYZ School Excels in Looking After Its Students' Interests."

"How XYZ School Contributes to Improving Data Processing Technology."

"How XYZ School Contributes to Improving Data Processing Education."

"How XYZ School Assists Data Processing Relations With the Community."

"What Prevents XYZ School From Being Even Better Than It Is."

In addition, copies of curricula, lecture notes, etc. should also be provided.

5. Schools intending to enter should notify Paul E. Salcido, Fotomat Corp., 920 Kline St., La Jolla, Calif. 92037.

association, and is assisted by Robert E. Finley, president of the San Diego DPMA Chapter, other representatives of our professional societies and by myself, in judging entrants.

The idea of calling for reports

is to bring out the different characteristics that a school should always be striving to improve. Its treatment of students is obvious, but how it helps knock down barriers to still further improvements is equally important, as are the other subjects on which reports are being called for.

The individual reports need not be long. They should, however, be long enough to allow other schools to evaluate the ideas, and decide whether they do in fact provide an improvement possibility that could be incorporated into their operations. These reports will hopefully be the main output of the contest.

#### Response to Criticism

In addition, the schools will also be asked to allow inspection, and to respond to any criticism made, so that the judges can also evaluate their capability to make improvements, and their willingness to consider alternatives.

I think the whole idea is great. If you do, why not get your school, and/or its current students, to contact Salcido?

And if you can let me know that you are proud of your school I could perhaps tell the world, just as I have told it that the Coleman College people are proud of theirs.

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## Poor Tape Quality Attributed to Design of Drives

"The tape drives are said to operate with computer tape of a particular specification, but the designers have failed to provide the users with any way of knowing whether his tapes match the specification. As a result, he has remained ignorant of the real situation concerning the differences between good and bad tapes — and has been purchasing unsuitable supplies without having any effective way of knowing what he was doing.

"The most important single action that could help the situation would be for each installation to have one drive modified

### Taylor Updates

so that it could be used to examine tapes in accordance with the drive designer's specifications."

This is the first conclusion of the Society of Certified Data Processors Technical Standards Committee as a result of reviewing the many responses from the Taylor Report readers after a recent discussion of the committee's tests [The Taylor Report, CW, March 1]. The committee also met with a number of manufacturers, and it is proceeding with investigations to improve the quality and usefulness of computer tape.

Other surprising data included finding that the claimed "error-free" characteristic was using unusual definitions of some words with special meanings to computer users — such as "permanent error," and which, in any case, did not refer to the

quality of the tape at first use by the user — or even at the time the tape was delivered to the users.

Instead, it refers to the condition of the tape when tested in the manufacturer's laboratories, on specialized drives, and as a part of the manufacturing process.

#### Tape Quality Changeable

Don Collins, committee chairman, points out that many things can happen to a Tape after it leaves the carefully regulated environment and these may affect the tape quality without the user's knowledge. There are problems in delivery, temperature changes even when a tape is moved from one room to another, or put into storage or in a vault. Some tapes are also being used with drives that have rubber capstans, although the backing of the tape is not suitable.

Collins says he was greatly encouraged by the attitude of the magnetic tape suppliers. Offers of help have come from many of them, as well as from large tape users. It will be some time before all the replies can be assimilated, but work is continuing very actively.

#### Inquiry Form Proposed

Meanwhile, the committee feels it must provide a recommended "inquiry form" which both gives the magnetic tape supplier the relevant facts about the installation and the possible ways the tapes will be used, and asks the supplier for details of appropriate tapes, and details of

quality or safety precautions that the user might feel were justified under the circumstances.

These precautions would include provision of details about sturdier spools and canisters, safer transportation from the factory to the installation site, labelling to prevent tapes that never should leave standard environments from being accidentally taken outside, or which

## Unprofessional Practices Committee

The SCDP Unprofessional Practices Committee is also analyzing the responses to its questionnaire from the Taylor Report readers [CW, Feb. 23]. This deals with whether providing output that does not arithmetically add up is really unprofessional. It is clear, however, that many of the items considered have been almost unanimously condemned by the readers and that some future consideration must be given.

#### Guidelines, Talks

The two most common suggestions as to what the committee should do are to publish guidelines, and also to arrange for discussions with the chapters of the various societies where the questions can be thrashed out more directly.

Al Kocourek, committee chairman, has already heard from one firm which has turned the guidelines into company procedures, and used them in the installation standards manual. So it appears that this approach will be possible.

detects chemically that the environmental rules have been broken. The tape may also have been unknowingly exposed to improper conditions.

Collins thinks such an approach can help purchasing officers get the value their needs require, but he still says first the tape drive/tape interface must be put into order by allowing the drives to check the current tape condition.

To make it work, however, the committee must receive copies of what appear to be bad or unprofessional output. As Kocourek points out, it is much easier to visualize specific examples, rather than try to handle items theoretically. And the committee will also need to hear from chapters which might like to discuss the matter scheduled now for next year's program. If you can help in either way, please write to Al Kocourek, 9365 Indian Camp Road, Columbia, Md. 21043.

#### Other Practices

In addition to the current work, the committee has begun receiving examples of what writers consider poor practices they would like examined. These include a bill which shows an inflated amount as due, together with the legend "The Law Requires that All Taxes Shall be Paid." The actual amount legally due (because apparently the law does not say that the buyer has to pay the sellers taxes for him) is not shown anywhere on the bill!

## FOR SALE

370/145

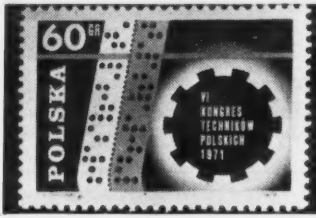
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Russian stamp issued in 1967 to commemorate industrial progress.



Computer tape stamp issued by Poland last year to honor Polish technicians.

## Countries Stamp Their Approval

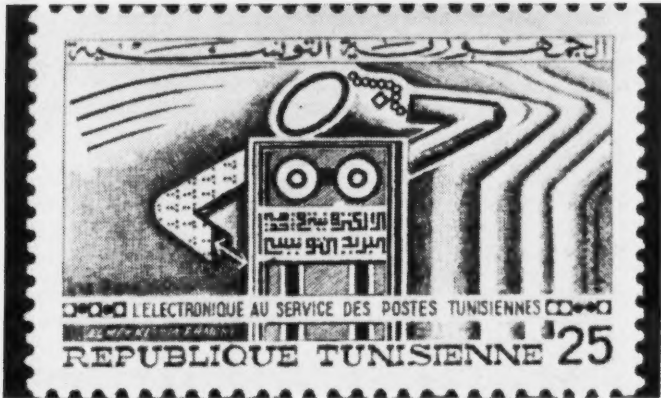
By M.W. Martin

Special to Computerworld

Since the first stamp honoring the computer industry was issued by Israel in 1964, 12 other governments have followed suit. There have been 22 such stamps issued and more can be expected, because once a stamp design is found acceptable in several countries, other countries usually follow the trend.

It is standard practice for postal administrations to honor important industries with postage stamps. Strangely, there is no U.S. DP stamp.

There are stamps which specifically deal with computers and others related to the computer industry — they depict mathematicians, pioneers in calculating machines and automation in all forms.



A "humanized" computer is the design appearing on three Tunisian stamps issued in 1968.



East German computer stamp issued in 1966 to publicize the 1966 Leipzig Spring Fair.



One of a set of designs made by computer, issued by The Netherlands.  
(CW Photos by L. Flanagan)



Ancient arithmetic and a computer card appear on the 1969 United Arab Republic issue.



Canadian census commemorative depicting a punched card.



The world's first computer stamp issued by Israel.



One of two punched card air mail stamps issued by Lebanon.



"Computer symbols" is the designation of this 1968 Colombian stamp.

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## Random Notes

**Cable Planning Package  
Runs on 360, ICL 1903A**

LEATHERHEAD, Surrey, England — Significant savings in the planning of large-scale power control and instrument cable projects are possible with the Computer Aided Processing of Industrial Cabling Systems (Capics) software for OS/360, from the Electrical Research Association.

Use of the three modules can reduce time and costs by as much as 50% in routing, sizing, scheduling and pricing of projects involving more than 250 cables. The package requires 192K bytes of core on the 360/370, but runs on ICL 1903 CPUs as well. The design module costs \$25,000. Lease plans are also available from ERA on Cleeve Road.

**Random Items**

Two software packages for Beta COM 600L and 700L units, from Gould Data Systems Division, Newton, Mass., permit the microfilmers to accept IBM 360 variable length blocked records, and format both fixed and extracted eye-readable titles and indices on the film output . . . Version VI of Panvalet, the direct access library system from Pansophic Systems Inc., Oak Brook, Ill., is being field tested prior to general release to users of older versions. There are said to be 25 user-requested enhancements in the new version.

PDQ Automation Inc. has opened a second office at 5100 N. Federal Highway, Ft. Lauderdale, Fla., to extend the service area of its data entry operations. The company says it can provide 24-hour turn-around on many jobs . . . Users of low-speed terminals linked to McDonnell Douglas Automation's XDS Sigma 7 can utilize the batch processing capabilities of the company's 360/195 as well, through a communications link, Conversational Batch Service. . . . Interactive Data Corp., Waltham, Mass., is strengthening its time-sharing service by replacing its single 360/67 with a duplex processor.

**Correction**

MINNEAPOLIS — The Series 2000 Data Base Management System from MRI Systems [CW, March 8] has been installed and in use on the Control Data Corp. Cybernet time-sharing network "for some time," according to a spokesman at Cybernet headquarters, 4550 W. 77th St., 55345.

**Service, Inspections...****Scheduler Watches Repeated Tasks**

By Don Leavitt  
Of the CW Staff

ATHENS, Ga. — Scheduling and reports of service on equipment, or any other periodic activity, are produced by the Sperry Automated Preventive Maintenance program from Cosmic, where it is catalogued as GSC-11408. The \$25 Fortran IV program can control maintenance schedules for DP hardware, but there is nothing in the package limiting it to that or any other equipment.

GSC-11408 has been used to time activities such as recalibration of oil refinery gauges and walk-through inspections of seldom-used buildings. The file structure allows complete freedom of task description and type of equipment or facility to which the task is related, a Cosmic spokesman said.

Frequency of activity is defined, as the program stands, in terms of meter hours or calendar days, but these fields can be redefined to serve any measurement scale the user wishes.

While each record in the file includes a series of "fixed data" fields, to define the job to be done, who is to do it and when it was last done, it also may include an expandable set of fields showing the results of each repetition of the job.

The records are supported by file maintenance routines. In addition to handling changes to the file, these routines print out those tasks which should be done

"now," one to a page, so that they can be distributed appropriately.

The user can also extract a list of tasks to be performed within a future time frame of his choice. If the time frame is long enough to require several repetitions of a task, the report will show this and the number of man-hours needed for each task.

Alternate processing options allow the user to extract maintenance histories by equipment item number, maintenance

costs by facility, or to print out the contents of the data file.

GSC-11408 was written at Goddard Space Center and uses approximately 27K bytes of core under OS/360.

Cosmic is a clearinghouse for programs, most of which were written originally for use at government DP installations, and which are now available for general use. It is part of the Computer Center, Information Services, 112 Barrow Hall, University of Georgia here in Athens, 30601.

**Tables in 'Swapper' Generator  
Change User Terms Into Cobol**

GRAND RAPIDS, Mich. — Programming can be done in terms appropriate to different applications, with the table-driven Swapper Cobol source program generator from Brown Bros. Enterprises (BBE). The phrases used by the programmer are entered with their Cobol "translations" just before Swapper is used.

Swapper also supports shorthand-style coding so that users can abbreviate many of the verbose but heavily used phrases required by Cobol. As many as 150 standard abbreviations which don't change from application to application can be stored in a 32K CPU, even allowing 8K overhead for an operating system, accord-

ing to BBE.

Since Swapper is written in Cobol and the user is provided source code, the package can be installed on almost any CPU with a Cobol compiler, a spokesman noted.

**Change Data Names**

In addition to its use in easing the coding of new programs, Swapper can be used to realign, reformat and resequence statements and to change data names and paragraph names in existing Cobol programs. The resequencing capability aids those programmers who rearrange the original order of their programs and then face the danger of dropping the source deck with its mixed sequence numbers.

The reformatting is done without intervention and in accordance with predefined rules. Procedure statements are indented under paragraph names. Qualifying conditions and dependent operations are indented from their base statements. And subfields within the data division are set in under the higher level items of which they are a part.

Swapper is available from BBE for a one-time charge of \$401. The firm is at 509 Fuller Ave., N.E., 49503.

**'Oliver' Eases T/S System Use**

PITTSBURGH — Subscribers of the On-Line Systems' time-sharing network have been able to reduce both disk storage requirements and search times, with the techniques for sorting and extracting data that are part of the company's On-Line Systems' Information Retriever (Oliver) data management system.

Information is arranged on the disk in related groups, each having a distinct number of subgroups or fields. A small file of pointer records is generated to realize more efficient use of the CPU and a "substantial" cost saving to users, a company spokesman said.

**Special Code**

For further efficiency, numeric data is converted into special code rather than being stored character by character. When combined with other storage techniques, this reduces the amount of disk space needed by an average of 40%, the company claimed.

Oliver is described as fully interactive and can be used in conjunction with

Fortran or Cobol programs or controlled through an English-like command language that non-programmers can use, according to the company. Security capabilities can be used to protect sensitive data from either deliberate or unintentional unauthorized access or manipulation.

On-Line Systems Inc. is at 4721 McKnight Road, 15237.

**NCR Adds Distributor Software**

DAYTON, Ohio — Wholesalers and distributors can generate either open-item or balance forward customer statements with the Accounts Receivable Commercial System software distributed without cost to Century 100 users by NCR.

The package is delivered in Neat/3 source code so that the user may adapt it to his own desires. Balance forward statements show the amount the customer owed at the beginning of the billing period, transactions posted to his account and the new balance owed at the end of

the period.

An open invoice lists prices for goods delivered to a customer regardless of when they are to be paid for, NCR noted. This type of billing allows the customer to pay or protest the prices on an item-by-item basis, and avoids the problems of aged accounts.

A customer list of 10,000 with 1,600 to 1,700 daily transactions can usually be processed in two to three hours on a 16K Century 100 with a dual spindle disk unit, a spokesman estimated.

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The thinner coating, in turn, means a more flexible and flatter-lying tape. Result: better head wrap, better capstan control, better head contact.

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And finally: our new BASF/2000A.D. base is a premium polyester, biaxially oriented. Edges are the cleanest in the

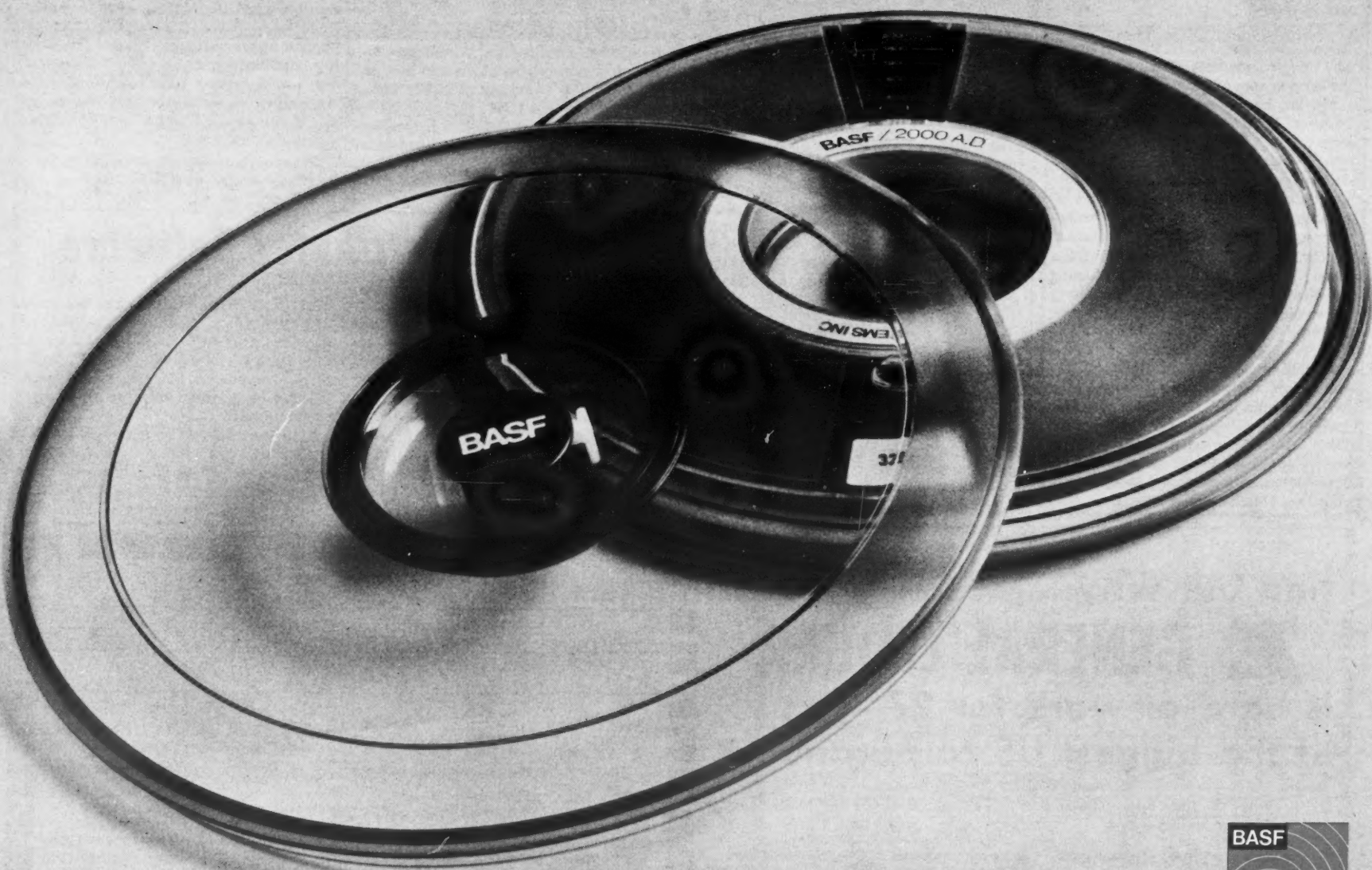
industry, cut to a tolerance of  $\pm .001''$  (vs the industry standard of  $\pm .002''$ ). We QC every step, from milling to packing. And we certify every tape.

There's one thing we *don't* do to our latest tape. We don't sacrifice any of the push for perfection that has always characterized our previous tapes. BASF/2000A.D., in other words, is quality added on — not a trade-off.

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## NBS Publication Provides Documentation Guidelines

WASHINGTON, D.C. — Users concerned with the problem of standardizing the documentation to describe their files can spend 25 cents to obtain the latest Federal Information Processing Standards publication (FIPS Pub 20) prepared by the National Bureau of Standards.

The Guidelines for Describing Information Interchange Formats is recommended by NBS for general use throughout the federal government. Though it contains few surprises for the experienced DP manager, it provides a checklist by which he can judge his own procedures.

The booklet reviews the media and the methods by which information is collected and interchanged, and then details how the physical and logical characteristics of a collected file should be documented.

In FIPS Pub 20, NBS deliberately avoids defining where these characteristics should be de-

scribed, noting that they might be on an outside label, on a machine-sensible label on a tape or disk, or in the documentation that accompanies a file.

The checklist is extremely thorough, and NBS notes that some characteristics do not apply in all cases. Listed are some 21 physical characteristics, ranging from the name, address and phone number of the person(s) who produced the file, through an indication of how many records are on the file "if known" and the security classification of the data.

The logical characteristics are divided into those applying to the entire file, each record type, the data elements and the field characteristics.

The booklet may be ordered from the Superintendent of Documents, Government Printing Office, 20402, where it is identified as SD catalog number C13.52:20.

## TP System Supports IBM 2260

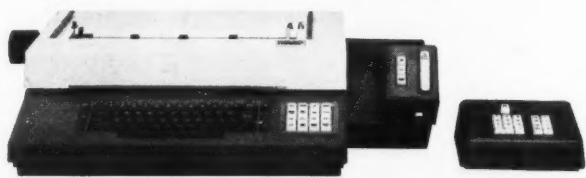
ARLINGTON, Mass. — The Telecommunications Programming Systems (TPS) from PHI Computer Services Inc., which allows an OS/360 user to control a teleprocessing network through a minicomputer used as a communications processor, now includes a support module for IBM 2260/2265 and compatible keyboard display terminals.

Through modules previously available, TPS users can handle teletypewriter and Ascii displays, the IBM 1050 and 2740/2741 family of terminals and binary synchronous terminals such as the IBM 2780.

TPS consists of three subsystems: the communications processor program, which allows the mini to operate in a choice of modes; the Communications Access Method which replaces IBM access methods; and the communications program generator, which allows the user to build programs for the mini on the 360.

Prices for TPS depend on the basic use of the mini, whether 2700 emulation or full front end, and the choice of other subsystems and support modules.

The firm is at 800 Massachusetts Ave., 02174.

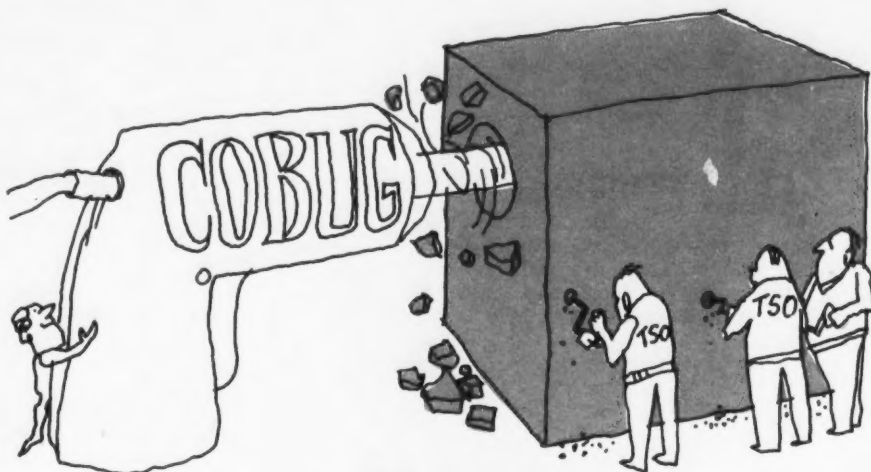


The Novar 10 key numeric input on the right can be added to Novar tape terminals by plugging it in. Greatly speeds up the terminal's capability to handle numeric data for computer processing. Does columnar tabbing too.

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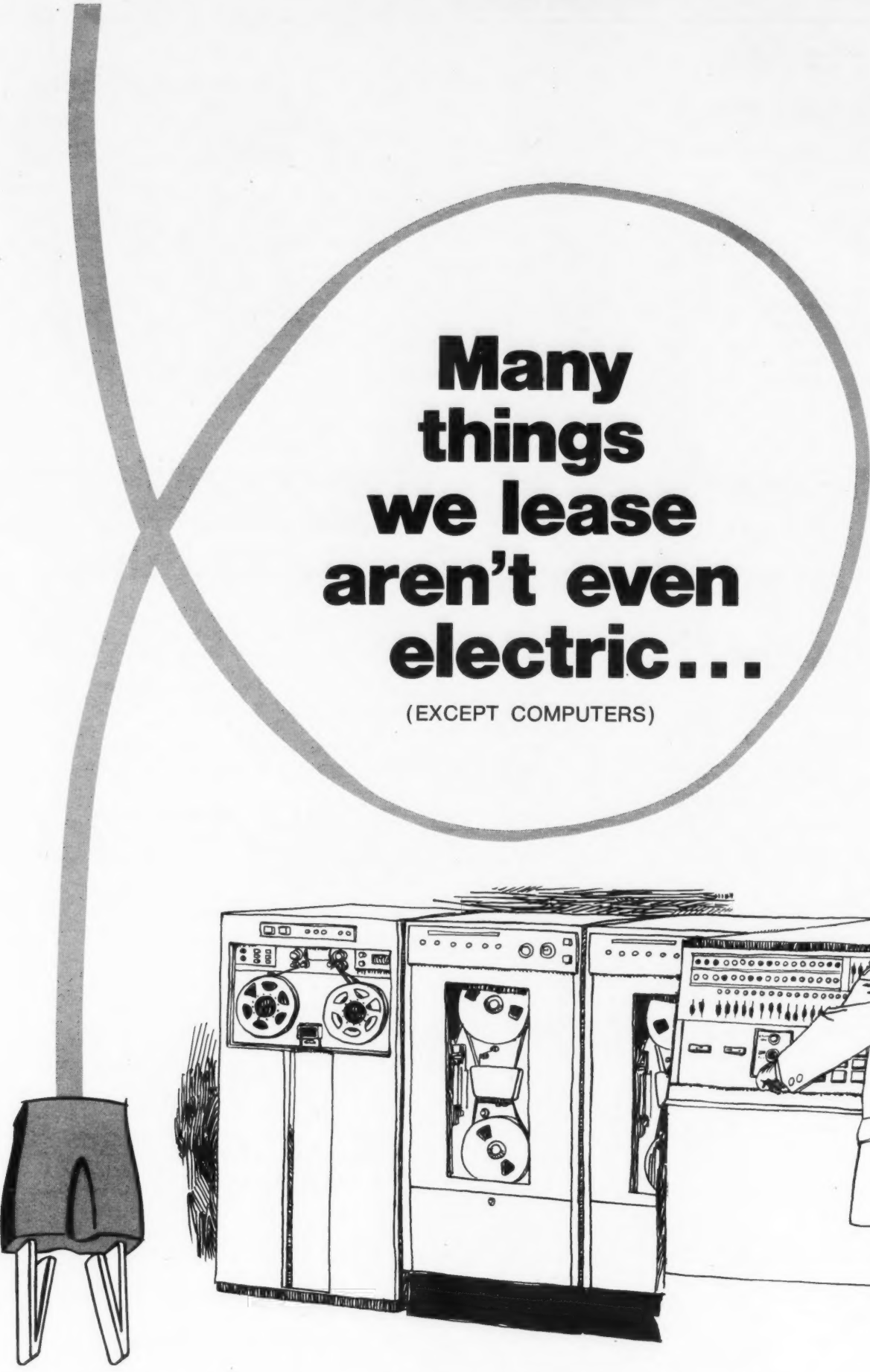
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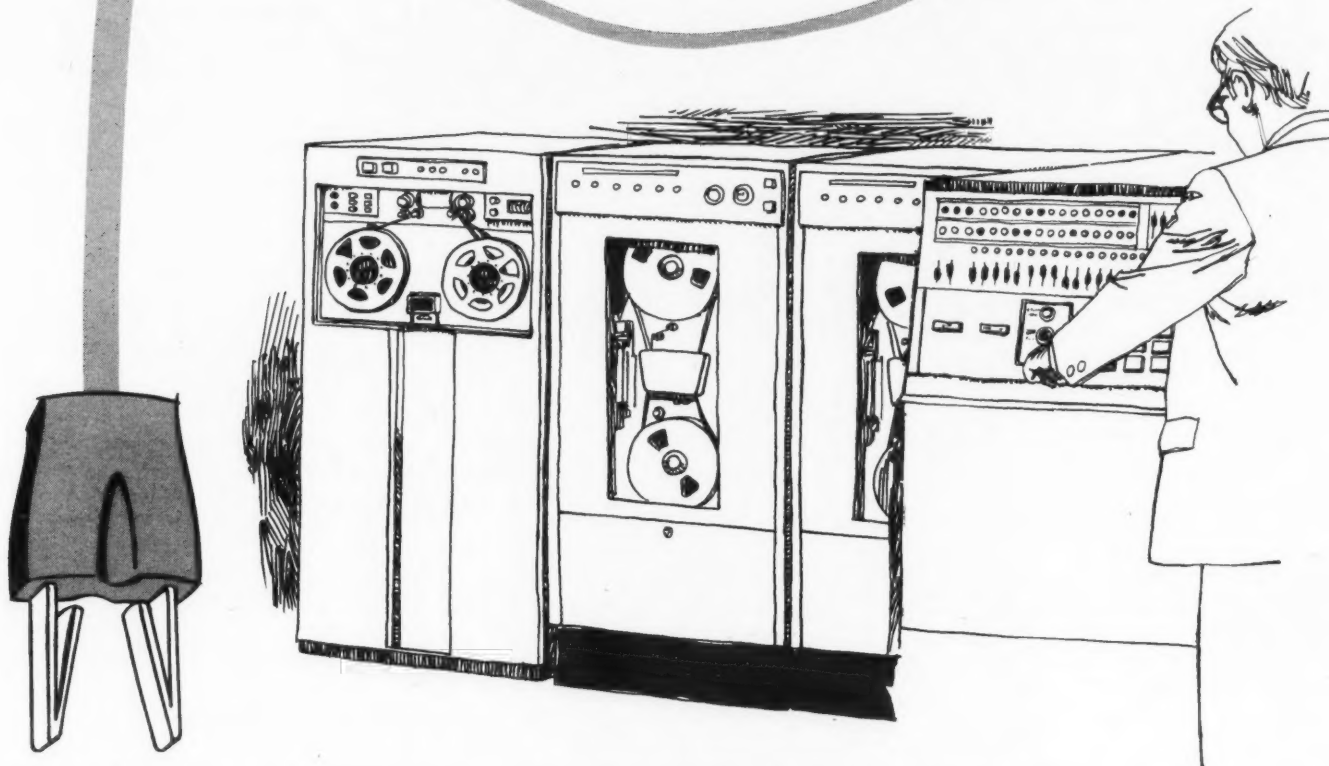
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## Bits and Pieces

### Itel Double Density Disk Delivered Direct to User

SAN FRANCISCO — Itel Corp. now offers its 3100 double density disk drives, effective March 1, directly to the end users. Previously Itel had sold this subsystem only to OEM customers.

The disk system was designed and manufactured by Itel's Information Storage Systems Division and is available for immediate delivery. It can be used with all IBM 360 and 370 systems.

### ITT Adds Tab Format Feature As Standard Feature on Envoy

EAST RUTHERFORD, N.J. — ITT Data Equipment and Systems Division has added a horizontal and vertical tab format control as a standard feature to its Model 3010 Envoy ASR Data-printer.

The tabs operate in two modes, one generating and recognizing standard Ascii tab codes and one which provides for transmission of formatted data to any receiving point, regardless of the receiving points tab settings.

The ITT Envoy Dataprinters are priced at \$2,750, and are available on a 30-day delivery from E. Union Ave.

### Terminal Uses Touch-Tone Input

GARDENA, Calif. — A data terminal from Computran, Inc., features Touch-Tone input and buffered storage.

The Computran 101 is a manual data entry device with a 15-character keyboard. Data is stored on a visual read out for visual verification. Punched paper tape, edged punch card, dialing card or magnetic tape readers can be attached.

The Model 101 is priced at \$525 and is available on a three-week delivery schedule from 1612 W. 139th St., 90249.

### Mark Reader Also Senses Punches

SAN DIEGO — Digital Development Corp. has added a hole sense option to its mark sense reader, enabling the simultaneous reading of prepunched and pencil marked data at 1,000 card/min. The reader can be interfaced to a data set or to a computer channel, the company said. Deliveries of the reader are 90 days from 5575 Kearny Villa Road, 92123.

### B&H Starts COM Service

WOOSTER, Ohio — Com-Plus, a new Computer Output Microfilm service from the Bell & Howell Micro Photo Division, converts computer data from magnetic tape to microfilm, and duplicates and distributes the film to as many user locations as the customer requires.

### COM Unit Meets Federal Rules

VAN NUYS, Calif. — Terminal Data Corporation announced a 48K reduction microfiche format disk for its line of COM (computer-output-microfilm) recording cameras. This disk-encoder will permit TDC's COM cameras to meet the new suggested format specification for the Department of Defense in its Miniaturization of Federal Catalog Systems (the Mini Cats Project), the company said. The Mini Cats format calls for 270 pages of data on a 4 x 6 inch microfiche.

Terminal Data Corp. is at 16130 Stagg St., 91406.

## Tape Holds Fixed Data

# MTST Used for One-Time Reporting

By Frank Piasta  
Of the CW Staff

PARK FOREST SOUTH, Ill. — Low-volume one-time reports that depend on a master file and variable data in relatively small quantities may be produced without a computer under a plan devised at Governors State University here.

The university didn't have its computer ready when it opened its doors two years ahead of schedule, so the automation of student information files pertaining to academic records was done with IBM MTST units.

### Interim Procedure

While used as an interim procedure (the school now uses CMSTs interfaced to an IBM 360/50), the techniques could be used by schools with fewer than 2,500 students and by businesses for specialized reports.

The admission, registration and evaluation procedures are continuous. The university has a completion/no record academic evaluation system. The academic record does not contain traditional items as course numbers, and grades and no hard copy is made of the student permanent record.

Also, none of the learning modules (classes) need have the same educational objective (recorded as achievements on student transcripts) for all students en-

rolled. And the achievement description may vary from session to session and even from student to student within the same session for the same module.

The instructors submit to Admissions and Records a list of objectives for each of their modules (classes) containing the module number and title, instructor's name and a numbered list of objectives to be recorded on an MTST tape. The recorded data is printed out and returned to the instructor for editing.

### Registration Forms

Student achievement forms are recorded on another tape with registration forms as input. These include the student's name and number, module index number and

title, session and year enrolled, units offered, units enrolled and units earned to date. These are printed out and given to the instructor as his student check list.

Data from the student achievement forms tape is used to print out the transcripts, while the code used by the instructor is used to insert the objective selected by the instructor from the taped list he had set up for the particular module.

### 40 a Day

An average operator, the school said, can complete 40 two-page transcripts per day. It took the school five days to collect, generate and distribute transcripts for 685 students, using three MTST machines and four operators.

## Range of Industrial Processes Handled by GE-Pac 3010/2 Mini

WEST LYNN, Mass. — Claimed to have the broadest capability in the minicomputer field, the General Electric GE-Pac 3010/2 is designed to meet utility and industrial process automation requirements ranging from the smallest single function control to a large integrated complex application.

The processor is compatible with the

older 3010 system, allowing the use of existing software and peripherals.

The processor requires four print circuit boards including those for console display and teletypewriter controller. Four more slots are used for memory, selector channel or custom-designed direct memory access control boards.

Memory is expandable from 8K to 64K bytes in 8K increments and the entire unit is packaged in a rack-mountable enclosure 14 in. high.

Operator communications are provided through the process monitor/control, steam electric evaluation and recording and supervisory control, and data acquisition. CRT displays also are used with options for four or seven colors, process graphics capability and operator-oriented keyboards.

A 2.4M byte moving head disk, magnetic tape and card punch are available in addition to the normal 3010 peripherals.

The 3010/2's analog input capability holds up to 1K points, signals ranging from 10 mV to 500V full scale, Form C relay switching speeds from 200 to 800 point/sec, 40 mV to 10V solid-state switching speeds from 2,000 to 10,000 point/sec and standard plug-in signal conditioning. There is also a modular plug-in expansion capability.

Process digital hardware includes up to 4K digital points, I/O functions with relay or solid-state outputs, along with digital sensing (ac or dc voltages) and relay or optical isolation from the process.

Typical systems prices are \$30,000 for applications requiring small process and peripheral I/O to medium-performance systems in the \$150,000 to \$250,000 range. First deliveries are scheduled for May 1972.

## CMC 5 Grows to 16 Keystations

LOS ANGELES — Computer Machinery Corp. (CMC) has announced a new expanded version of the CMC 5 Keyprocessing system including a new Keystation.

The CMC 5 offers greater growth capability and accommodates up to 16 Keystations compared to 12 previously, at \$90.90 per Keystation, including Keystation desks, based on a 32-Keystation configuration, the company said.

The CMC 5 includes several new features such as data validation and data communication, and offers 18,000 record storage capacity as standard, compared to 10,000 previously. It operates with either the new CMC 103 CRT Keystation or the CMC 105 Keystation, or both intermixed, and offers 100 record format storage as standard, with options adding up to 480. Delivery is scheduled for the fourth quarter of this year.

Features of the CMC 103 include 128-character CRT display; the screen

shows 112 data characters plus a 16-character message indicating column number, field number, format level and other status information. Operator assistance features include individual field separator marks in the data display, cursor, separate "Alert" and "First Character" indicator lights, and standard CMC audible cues.

The desktop design of the unit permits both the display unit and the cable-connected keyboard to be movable. A user can mix and match CMC 103 and 105 Keystations on the same CMC 5 Keyprocessing System.

In addition to its Keyprocessing systems the company also offers the CMC 36 for off-line printing.

The CMC 103 leases for \$70/mo and delivery is scheduled for the second quarter of this year from 2231 Barrington Ave., 90064.

## Datapoint Gets Larger, Faster

SAN ANTONIO, Texas — Computer Terminal Corp. has an expanded and faster version of the Datapoint 2200 aimed primarily at the business data entry market.

The Datapoint 2200 computer-based terminal contains a keyboard, display and two integral digital tape cassettes, all under control of the system's internal, small computer.

The internal computer has a read-write programmable memory of up to 16K bytes with a 500 nsec access time. The 2200 can be ordered in 4K, 8K, 12K or 16K byte models. The original 2200 Version I had a maximum memory of 8K and an access time of up to 500  $\mu$ sec.

For additional processor power an interrupt feature has been added. The interrupt ability allows convenient servicing of peripheral devices in a minimum of time, the company said.

Lease price begins at \$185/mo for a 4K

machine. Deliveries on the Datapoint 2200 Version II will begin in late March, from 9725 Datapoint Dr., 78284.

## Techtran Device Has Cassette



4100 Communications Terminal

ROCHESTER, N.Y. — The 4100 Communications Terminal, from Techtran Industries, using mag tape cassettes, is plug-compatible to most data terminals and minicomputers.

The device features switch-selectable speeds from 100 to 2,400 bit/sec, high-speed search, full remote control data edit with ability to rewrite data and to shrink or expand already recorded data files, auto-answer, on-line/off-line operation and non-print operation.

The 4100, at \$1,650, is also available in an IBM 2741-compatible version. Delivery is 30 to 45 days from 580 Jefferson Road, 14623.



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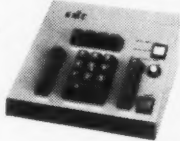
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## Schools, Colleges Attest to APL Growth

There have never been more fervent advocates of a programming language than among the followers of APL! Each year the March issue of *Computing Newsletter for Instructors of Data Processing* features APL and each year it is inundated by requests for copies.

Last year's issue compared programs written in Fortran, Basic, and APL. Computing the average of a set of numbers required 11 statements in Basic, 10 statements in Fortran, but only one statement in APL.

This year's issue relates the use of APL in the public schools, community colleges and universities. Now that several manufacturers, and at least five time-sharing firms, provide APL capability, the language should be evaluated by each school.

Iverson-oriented machines, based on the vector, tensor approach, may be the thrust of the fourth generation of machines, instead of refinement of the present Von Neumann-oriented machines. CDC's huge Star computer at Livermore is said to be 95% Iverson-oriented.

IBM's program product

APL/360 is operated on one of the Atlanta public school system's 360/50s.

High school students obtain a facility in the language after five hours of formal instruction. An eighth grader wrote a tutorial module in German.

For an example of the use of APL in the community colleges, look at the two-campus operation of Orange Coast College (Costa Mesa) and Golden West College (Huntington Beach) in California.

The language was adopted both for students to solve class assignments and for instructors to develop computer-assisted instruction modules. Professor John Clark estimates some 4,000 of the school's 26,000 students have a facility with APL. User growth is 40% per year.

The two campuses share an IBM 360/50 with 92 IBM 2741 communication terminals. Some 60 terminals can be operated simultaneously without system degradation.

Approximately 45 instructors are writing programs for computer-assisted instruction. Over 300 CAI modules have been developed. Almost all subject areas are included, principally English, social science, physics, math and business.

Clark says students find the language "very easy to learn," and he feels the language is "a complete generation ahead of any other language."

Students have access to APL at

Syracuse University, the Universities of Massachusetts, Maryland, Washington and Montana State University. APL is used in the universities of Ontario and Alberta in Canada.

Approximately 10% of the 8,000 Montana State students have an APL proficiency, according to computer center director Lou Lucke. Some 48 teletypewriter terminals are connected to the school's Sigma 7, 320K byte computer. APL users are very active, consuming 27% of the computer time at MSU.

#### Graduate Programs

An example of APL's use in a graduate program is provided by Professor Ted Mock of UCLA, "I used APL extensively last spring in a graduate course called planning and control systems, the second one in our information systems core. The students, none of whom had been exposed to APL previously, learned the essential business features of the language during the first two weeks of the quarter.

"The interactive nature of APL/360 was, of course, useful as was the public APL library which includes plotting, L.P., forecasting and other routines. On the whole, the language was enthusiastically received although there were some output formatting difficulties."

Copies of the 1971 and 1972 March issues of the *Computing Newsletter* containing bibliographies of APL publications are available for \$2 each from Box 9630, Colorado Springs, Colo. 80909.

Couger is professor of computer and management science at the University of Colorado.

#### Students Get Diet Aid

LOS ANGELES — A computer printout is helping change the food input of nutrition students at Los Angeles Valley College here.

Students record everything eaten for a week and a computer analyzes their diets. The program lists the actual intake of calories and nutrients; the recommended amounts of each nutrient for persons of similar age, height, weight and sex; and the percentage of that recommendation met by the student's diet.

As part of the analysis, the student also receives instructions on how to decrease calories, carbohydrates and fats, while increasing protein and other essential vitamins.

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## Improvement Forum

## Honeywell Users Plan Full Schedule

ATLANTA — An extensive program of meetings on "Improving System Performance" is planned for the Honeywell Users Group Spring Conference here, April 10-12.

Users may participate in the User Improvement Forum, designed to reveal the "experiences of individual members in solving

Societies/  
User Groups

and/or circumventing vendor software problems." Experiences being covered by the forum include software modification, both enhancements and corrections; in-house software, or "special programs written to satisfy a particular need not adequately provided for by the vendor", and procedures, such as "particularly successful methods of handling test, compiles, program revisions, etc."

The Honeywell Fortran Special Interest Group has requested advance notice of problems, questions or subjects for discussion.

The first day's meetings will be devoted primarily to discussions on Cobol, while most of Tuesday's sessions are on Fortran. The Operating System Workshop Meeting will include the Mod 8, Mod 4 and O/S 200.

Wednesday's general session

will feature a keynote speech by Howard Bromberg, president of Information Management, Inc. and a presentation of the Series 2000. Afternoon sessions include discussions on system evaluation techniques, software

monitoring, field engineering support systems, data base special interest group, specifications for selection of computer alternatives and a diagnostic clinic, called an "open discussion of any and all problems."

## Ryan to Keynote Univac Meeting

HOUSTON — Dr. Frank B. Ryan, director of House Information Systems in the U.S. House of Representatives, will be the keynote speaker at the Univac Users Association Spring Conference, April 11-13, in the Shamrock-Hilton hotel here.

Ryan will discuss the impact of computer applications on the legislative process in Washington, with particular reference to its effects on senators and representatives. He is currently involved in the design, purchase and installation of all computer systems for the House of Representatives.

The conference theme is "Accelerating Productivity Through Computer Utilization." Workshop sessions for each Univac computer system will be held, as well as other meetings devoted to specific computer applications. Special interest groups of state and local government, financial publications and printing users will meet April 10.

For more information contact

C.J. Rachel, executive secretary, UUA, Univac Division of Sperry Rand Corp., P.O. Box 500, Blue Bell, Pa. 19422.

## IIA Features Session On On-Line Centers

NEW YORK — A session on "On-Line Information Centers Managing Machine Readable Information Resources" will be featured in the Fourth National Meeting of the Information Industry Association (IIA) here April 10-12 at the Roosevelt Hotel.

Presentations on Illusions and Delusions of On-Line Information Retrieval, Information Utilities, and Time-Sharing Vendors of On-Line Data Bases will be featured at the session.

Other sessions include: Information Centers — Robust Phenomena of the 70s; Information Center Operations; and Data Base in Strategies.

## Calendar

April 5-7, Paris — Fourth Annual Electronics Conference. Contact: IPC Business and Industrial Training Ltd., 161/166 Fleet St., London, EC4, England.

April 12-14, Venice — Second Edition of the International Computing Symposium. Contact: Federazione delle Associazioni Scientifiche e Tecniche, P. le Morandi 2, 20121 Milan, Italy.

April 13, Washington, D.C. — Educom Annual Spring Conference "Networks for Higher Education." Contact: H. Eugene Kessler, Executive Director, Educom, Interuniversity Communications Council, Inc., P.O. Box 364, Rosedale Road, Princeton, N.J. 08540.

April 19-21, San Francisco — Seminar "Designing Computer-Based Payroll Systems." Contact: American Management Association, Inc., AMA Building, 135 W. 50th St., New York, N.Y. 10020.

April 24, New York — Communications Systems Management Association Spring Regional Seminar on Interconnection. Contact: T. Richfield, Communications Systems Management Association, Suite 303, 1102 West St., Wilmington, Del. 19801.

April 30-May 3, Bal Harbour, Fla. 1972 National Operations and Automation Conference. Contact: American Bankers Association, 1120 Connecticut Ave., N.W., Washington, D.C. 20036.

May 1-4, Amsterdam — The Third International Conference on Computer Management. Contact: Conference Secretariat, Ifip-Administrative Data Processing Group, 6 Stadhouderskade, Amsterdam 1030, The Netherlands.

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## Users Plan Output Format Library

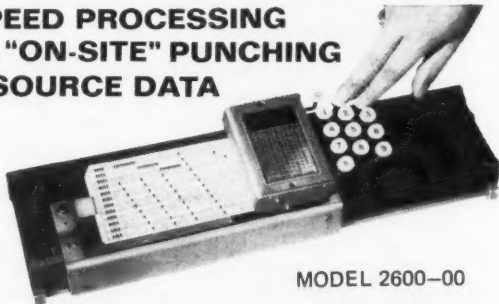
DAYTON, Ohio — The NCR Retail Computer User's Group will meet April 11 and 12 to establish a library of output formats and review modifications to the packages and "bugs" in the packages that have been discussed previously.

Each user is requested to bring a sample of each report produced by his store. The library "may be an invaluable source of information for anyone contemplating new systems or mod-

ifications," according to President Joel H. Newman.

Attendees will have a chance to see the Fashion Merchandise Reporting System being piloted at the Elder-Beerman store here and to participate in an open discussion period with representatives from NCR.

For more information on the meeting at Holiday Inn South, contact Joel H. Newman, Davidson & Leventhal, 201 Main St., New Britain, Conn. 06050.

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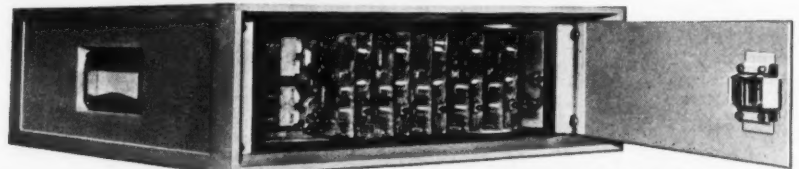


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### The Professional's Viewpoint

## CDP Exam Called Current, Ambiguous

Candidates responding to the SCDP 1972 Candidate Debriefing Questionnaire [CW, Feb. 16] mainly felt the examination was more up to date than outside criticism realized, although attention paid to specific developments such as COM and Cobol had some negative comments.

The major criticism in nearly all the responses, however, concerned the ambiguity of the ques-

"The Professional's Viewpoint" is prepared by the Society of Certified Data Processors, 633 Central St., Framingham, Mass. 01701 in conjunction with the editors of *Computerworld*.

tions, — the candidate had to guess what the examiner was thinking about, rather than answer the questions. This was particularly shown in the comments on the management sections. Readers felt that situations were taken out of context.

The amount of non-accounting questions in the quantitative methods section was criticized by several readers, while some responses were con-

cerned with whether the slant of the questions was right.

Specific responses follow.

### '...Relevant to a Degree'

"All sections were relevant to a degree. However, the quantitative methods section tested memory of specific items more than general principles. It seems to be unimportant to remember the formula for binomial distribution (it can be looked up when needed), and more relevant to remember, the need to determine whether your population has the characteristics of binomial distribution.

"I found the principles of management section most difficult because I could not determine confidently the point or points tested for, and therefore, guessed at the answers. Again, it seems that the need for testing in this area is relevant, but the questions failed to accomplish the goal."

Jay Hocott  
Little Rock, Ark.

### 'Most Irrelevant, Ambiguous'

"I feel quantitative method is a necessary requirement to meeting the central objectives of the CDP. However, the 1972 exam was the most irrelevant, ambiguous task I have ever undertaken. Of the 60 questions in the exam, only 12 were remotely related to accounting, and the rest were either math or statistics.

"The unfortunate fact was that there were extremely few of these remaining 48 that practically pertained to the data processing profession. In the management section, about 50% were in data processing management, but in quantitative methods the ratios were completely out of balance and slanted toward scientific and mathematical problems.

"However, few specific questions about operations research or practical applications of statistics were in the exam. Questions requiring complete memorization and recall were frequently the order. I feel this section should be carefully studied to make the questions relevant to the central objectives before the next exam in 1973."

Robert J. Brumm  
Green Bay, Wis.

### Reader Finds Potentially Ambiguous Questions

"Did I find any questions potentially ambiguous? Dozens of them. A few ranked more than others:

- "The question about largest capacity auxiliary storage devices generally available in normal use. Two hedges in the same question! Depending on where you work and what you know, any of the answers offered was a good bet.

- "The question about finding the area, under the curve. The value of the function is not normally considered the altitude of the curve. The similar answer, the integral of the curve, could also have been chosen, depending on whether you wanted an analytic solution (which might still require a computer program to evaluate) or a digital integration technique, which would use the altitude, i.e. perpendicular height above the origin.

- "Most of the questions containing 'generally,' 'usually,' 'most important,' 'least important.' Strong arguments could have been made for several answers based on specific hardware or language involved, objectives of the installation or situation."

Patricia P. Watt  
San Jose, Calif.

### 'SCDP Has Had an Impact'

"I got the feeling that the concern expressed by Alan Taylor and the Society of Certified Data Processors has had an impact upon the DPMA in reviewing the exam."

L.C. Merich  
Granda Hills, Calif.

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# COMPUTER INDUSTRY

March 29, 1972

a Computerworld news section about the nation's fastest growing industry

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## CI Notes

### 'Bubble' Products Near?

NEWTON, Mass. — The first products using the long-talked about magnetic "bubble" technology are reportedly being readied for introduction by Cambridge Memories Inc. here.

The two products, expected by the Spring Joint, use the firm's Domain Tip technology. One is said to be aimed at the core market, offering slightly lower performance at around one-tenth the cost of cores.

The other is expected to be a disk replacement with greatly increased performance at about the same per bit price as disk units currently available.

### Burroughs, DSA Sign Pact

WASHINGTON, D.C. — Despite protest from IBM the Defense Supply Agency has signed a \$24.3 million contract with Burroughs for two "very large" B6500 configurations.

IBM has protested two similar contracts to Burroughs and no decision has yet been made on those protests. The computers covered in the new pact will be used as part of the Defense Department's Defense Integrated Data Systems (Dids) which will serve as a central repository of logistics information.

### Governor Blasts IBM Plug

DES MOINES, Iowa — The use of official state stationery by IBM in a release plugging IBM computers has been blasted by Gov. Robert D. Ray here.

"I do not use my position for advertising purposes and I expect other state employees to do the same," the governor said after learning that State Comptroller Marvin R. Selden had allowed IBM to use state stationery for a release on the state's computer system. Selden told the governor it was a mistake on his part and that he wasn't thinking about the commercial aspects.

Ray promised he would not allow any more IBM releases to be sent out on state stationery. "This is not a proper practice for the state to be part of a promotion for a particular company," he said.

### Supershorts

Iomec will acquire the business and assets of the data activities segment of Digitronics Corp., under a recent agreement.

Addressograph Multigraph Corp. has announced its entry into the point-of-sale equipment market following an agreement with TRW Data Systems, Inc. to market and service a new electronic inventory and cash control system for the food-service industry.

Infonics, Inc. has been granted a patent covering high-speed in-cassette duplicating equipment.

The Air Force has accepted its first Planar Coax packaged computer, delivered by Bunker Ramo Corp., under an advance development project.

Data Products Corp. has delivered its 250th SR 300 mini-card reader to Data 100 Corp. under a long-term, \$750,000 contract.

## Overall Software to Lag

## Packaged Products Spurt Predicted

By E. Drake Lundell Jr.

Of the CW Staff

NEWTON, Mass. — Economic recovery in the software industry will lag behind the rest of the computer industry, according to International Data Corp. (IDC) here.

But at the same time, the firm predicts that sales of packaged software will spurt by 24% this year and 26% next year. Other segments of the software industry will also show recovery by 1973 IDC said, powering the whole industry to a 15% to 20% growth rate in that year.

The report indicates that revenues from packaged software products will increase to \$126 million this year from \$102 million in 1971. By 1973 revenues from packaged software will increase to \$159 million and by 1976 IDC expects total revenues from this segment of the software industry to reach \$289 million.

The growth rate in custom programming will not be as rapid, IDC predicts, but will start from a larger base of revenues.

From a base of \$346 million in 1971, contract programming will grow to \$464 million by 1976, the firm says.

But the prospects are less bright for this year and next. In 1972 IDC expects custom revenues to drop to \$278 million and fall back to \$320 million in 1973, still below the 1971 figures.

The total revenues in the software market, hit by the decline in custom work, will drop from \$448 million in 1971 to \$404 million this year but will then rise to \$479 million in 1973 and \$753 million in 1976.

General demand for software, IDC states, is proportionate to that for hardware and computer shipments will rise 19% this year, thereby creating the demand for software of all types in 1973.

In addition, the firm claims that "top-notch" programmers seem to have disappeared from the ranks of the unemployed, so software development will require increasing amounts of outside assistance from firms servicing the users' needs for software.

Users' external software budgets are increasingly being spent for packaged software as opposed to custom work, the report states.

In 1972 alone the percentage spent on

packages will increase to 31% of the total external software budget, up from 23% spent in this area in 1971, the firm adds.

But while expenditures for outside software may be rising, IDC notes the user continues to spend most of his software budget on internal projects.

In 1971 alone, IDC estimates users spent \$3.2 billion for internal software development as opposed to the \$448 million spent on software from outside sources and vendors.

"This difference will increase still further," the report claims, "as the availability of additional packages allows users to obtain more outside software for a lower total cost."

## 'Fourplex' May Be CDC Method To Compete With IBM 3330 Sales

By Frank Piasta

Of the CW Staff

MINNEAPOLIS — "Fourplex" may be the next technique used by Control Data Corp. in its 3330 replacement effort.

The technique, still under development, involves increasing the amount of data recorded on a standard 2316-type pack by a multiple of four, twice that of double density drives and equal to that of the 3330.

Company plans for add-on peripherals for the 360 Series include core and tape drives as well as disk replacements, according to W. H. Heath, director, sales

operations.

Control Data can be expected to market its OCR devices more actively, Heath said. Led by a laser scanner near completion, the stand-alone line will include a full range of devices up to the "super-scale," according to Heath. A set of plug-compatible units is also under study, he noted. The laser scanner, Heath said, offers the highest throughput for the dollar of any OCR technique.

Objections to the dual-density devices because they are not compatible with 2314-type units are usually overcome by the installation of a spare drive unit as a backup in case of drive failure, Heath added.

The problems some 360 users have been having with add-on memories, in the area of mainframe maintenance, have a possible negative effect on the sale of all compatible devices, according to Heath. He said some users will reevaluate their decision to go independent if they fear a total loss of maintenance.

The moves by IBM, however, are not seen by Heath as affecting CDC marketing plans. He pointed out the user of CDC drives could save as much as 17% on non-upgradable, noncancellable five-year contracts.

## Figures Revised

## Minis Pace Process Control Sales

NEW YORK — Minicomputers will account for over 31% of the total computer sales to the process control market by 1975, up from just over 21% in 1970, according to Frost and Sullivan here.

In a new survey of the process control field, the research firm has revised its estimates of the growth in the market slightly downward from projections a year ago.

Overall, the firm now predicts the total market will exhibit a 7% annual growth rate over the next eight years — and the use of computers in process control systems will grow by 14% in the same periods.

Computers used with such systems were valued at \$112 million in 1970, and this will grow to \$175 million in 1973, \$225 million in 1975 and \$415 million in 1980, the firm said.

All major domestic end user markets will increase their purchases of process control equipment led by the chemical industry as the largest end user, Frost and Sullivan said.

Electric utilities, metals and the petroleum industry will be the next largest customers for process control equipment, but the water supply and sewage treatment market is the most rapidly growing user of process control equipment, the firm said.

It is still too soon to determine the long-term effects of President Nixon's new economic program on the process control market, the firm said, but the passage of the investment tax credit should result in increased process control

sales, it added.

At the same time, Frost and Sullivan said foreign sales will grow more rapidly than domestic sales over the long term.

Both here and abroad, the firm said, digital process control computers and on-line analytical instruments should grow more rapidly than the total process control sales over the next few years.

## Telex Revises Suit Against IBM

TULSA, Okla. — IBM's fixed-term lease plans have been challenged as part of Telex Corp.'s \$875 million antitrust suit against the industry giant in federal court here.

## Cray to Leave Control Data, Plans Small Research Firm

MINNEAPOLIS — Seymour R. Cray, the designer of Control Data's large-scale computer line, will phase out of his full-time position with the firm during the next year, but will continue to assist the firm on the development of the 8000 line.

Cray said he was contemplating "the establishment of a very small basic computer research laboratory funded by myself and perhaps a few personal friends."

After he phases out his activities with Control Data, Cray will continue to serve as a consultant to the firm, and Control Data will possibly make an investment in his new firm.

Telex has updated its suit with a request for temporary and permanent injunctions barring IBM from offering extended term leases to Telex customers and from renewing any of its present fixed-term leases on their expiration.

### Contrary to IBM?

Telex charges the extended lease plan, introduced with the 3705 controller, and the fixed 12- and 24-month lease plans, introduced last May on disk drives, tape drives and printers, are contrary to the previous IBM policy of offering monthly rentals and leases.

It also charges the plans "lock" IBM customers into IBM equipment and customers are penalized by the plans when they want to switch to compatible equipment from other manufacturers.

In the original suit Telex asked for the dissolution of IBM and treble damages that amounted to \$875 million.

IBM said the new charges were without merit and it would defend itself in court.



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## The Format

- Each Day 9:00-9:40 Keynote address by a nationally known expert — an independent, not a vendor — on the day's main subject. Sets the stage for discussions.
- 9:40-10:30 Panel discussion led by regional experts chosen for their progressive management principles. Questions encouraged.

10:40-11:45 Workshops — panel members conduct separate workshops. Your specific questions fielded, worked out.

12:15-1:30 Conference luncheon — keynote speaker summarizes chief points covered during panels and workshops.

1:00-7:30 Exhibits open, stay open 'til 7:30. Exhibitors will show the latest in hardware, software, services.

## The Subjects

### First Day: Data Entry

Keynote speaker; Lawrence Feidelman, President, Management Information Corp., Cherry Hill, N.J.; Editor, *Data Entry Today*.

*Panels and workshops will be grouped by these four subjects:*

- Key punch replacement; key to tape, disc and cassette devices.
- OCR.
- Intelligent terminals — distributed processing.
- Direct data entry/source data automation.

### Second Day: Data Communications: The Choices

Keynote speaker; Dr. Dixon Doll, Data Communications Consultant, faculty member, Graduate School of Business, Eastern Michigan University.

*Panels and workshops will be grouped by these four subjects:*

- Communications equipment from main-frame makers and common carriers.
- Communications equipment from independent suppliers.
- Data transmission via private (lines, microwave) networks.
- Data transmission via carriers (lines, microwave).

### Third Day: Operational Efficiency

Keynote speaker; Charles Lecht, President, Advanced Computer Techniques, N.Y., N.Y., author of *The Management of Computer Programming Projects*.

*Panels and workshops will be grouped by these four subjects:*

- Core extensions.
- System/utility software modifications.
- Independent peripheral usage.
- Dedicated systems vs. general purpose computers.

### Panel Members & Workshop Leaders

The regional experts who will run the panels and workshops have been chosen from a wide range of firms and institutions. Some will participate in more than one session, depending on their experience and expertise.

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- 11 Communications/Printing/Publ.
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<input type="checkbox"/> Los Angeles	Ambassador	Apr. 4-6
<input type="checkbox"/> San Francisco	Fairmont	Apr. 10-12*
<input type="checkbox"/> Chicago	Palmer House	Apr. 18-20
<input type="checkbox"/> Detroit	Cobo Hall	Apr. 25-27

\*Monday-Wednesday Schedule

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## 'The Peripherals Company'?

# Telex Plans Add-Ons, Tape, Disk Devices

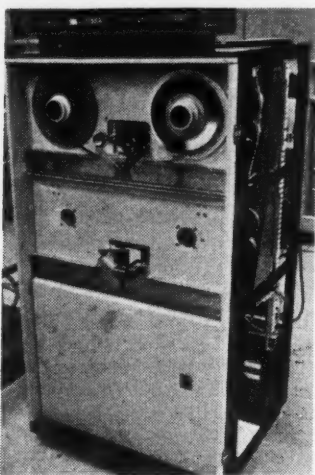
By Frank Piasta  
Of the CW Staff

TULSA, Okla. — Telex plans to expand its line of products in an attempt to be known as "the peripherals company" by 1975, company officials said here last week.

The line will include add-on compatible memories for the IBM 370, to be delivered before the end of 1972, and, further in the future, data communications terminals. The company eventually plans to produce its own computers, according to officials.

### Bipolar Circuitry

The add-on memories will be manufactured entirely by Telex,



Telex 6410 dual tape drive prototype being assembled.

will use bipolar circuitry and perform "at least as fast" as the units on the IBM 370 models 145, 155 and 165 they will replace, according to Desmond Jones, engineering vice-president.

The simpler wiring in the bipolar circuitry is credited for the selection of this technology. Contrasted with core, the bipolar circuits require only one voltage level, compared to four or five for core. The solid state circuits, however, require four to five times the power used by core.

Due to be shipped during the third quarter are Telex's 3330 replacements, the 6330 disk

systems. The 6830 control unit is currently undergoing pilot production in the company's Santa Clara facility and will almost certainly be coupled with disk drives supplied by Information Storage Systems, according to John F. Kevill, general manager of the California plant. Drives built by Century Data Systems and Control Data had been considered.

Telex also plans to produce its own disk drives at the Santa Clara plant, Kevill added.

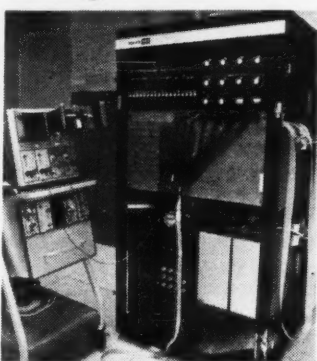
The Telex 6420 series of magnetic tape drives is also nearing production status, and is undergoing final testing at this time.

### Field Modifications

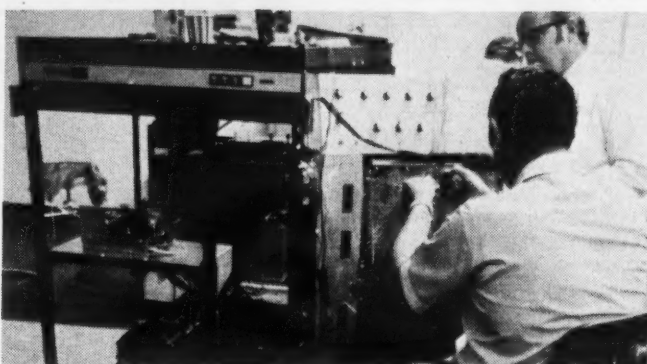
The units, intended as replacements for the IBM 3420/3410 systems, are designed to be upgraded or downgraded in the field in two hours or less. This, Telex said, benefits the user who buys his peripherals, and leasing companies since it allows the system to be reconfigured easily.

The Telex disk controller, Kevill said, includes several unusual features not found on the IBM equivalent. The device is provided with microprogramming, loaded from a cassette that performs automatic "self-diagnosis" at initial program load. An off-line interface testing capability is included.

Performance is claimed to be equal to or better than that of the 3330, with better serviceability thanks to fewer, larger components. TTL, MSI and LSI technologies are used.



Prototype of solid state Telex memory undergoing tests.



Telex technicians make adjustments on prototype disk controller. (CW Photos by F.J. Piasta)

Telex is developing its own software for on-site testing, including stand-alone routines for off-line testing and operating system subroutines for on-line use.

A general-purpose I/O exerciser to check out memories as well as tape and disk drives is also being

developed. It will run under a diagnostic monitor that is an extended version of IBM's Friend.

Final subsystem testing will be performed on-line on a 370. OS access methods used by customers, such as Sam, Isam, Bdam, PAM, Qtam and others are simulated.

## CDS Shows 'Floppy' Disk At Invitational Displays

NEWTON, Mass. — Century Data Systems is presently showing a "floppy" disk drive priced at \$750 in single quantities to potential OEM customers.

The CDS-100, which stores up to 653,312 bits on each disk and has a transfer rate of 33.3 kbit/sec, is being demonstrated as part of the traveling Invitational Computer Conferences, backed by Century Data.

The unit was developed for use in the controller of Century Data's "3330-like" disk drive and is now being sold as a possible replacement for cassettes in some applications and to other manufacturers of 3330-like drives.

### 32 Tracks

The disk used with the unit is an oxide-coated, mylar-removable cartridge that is 7.5 in. in diameter and accommodates 32 tracks of data. Track-to-track positioning is accomplished at 333.3 msec per single step, the firm said, and a complete disk can be written or read in 42 seconds.

Designed for high-speed trans-

fer of small amounts of data, the unit should find applications in storage and loading of microprograms, remote terminal data acquisition and auxiliary storage, the firm said.

The unit, which is media interchangeable with the IBM 23 FD-11, is available in read only or read/write versions, the firm said, depending on OEM requirements.

The Invitational Computer Conferences are a "huge" success, according to the organizers and exhibitors at the show here.

Non-competing manufacturers in the OEM business get together to rent hotel space in which to display their wares. Approximately 12 OEM firms are displaying in the present round of shows.

There is no cost for the exhibit, except the hotel costs, which are split equally between the exhibiting firms.

The crowds are small — anywhere from 125 to 300 — in the cities visited, but "they're the people we want to reach," according to one exhibitor. Admission is by invitation only.

## Cambridge Memories Lands Army, Navy Replacement Memory Pacts

NEWTON, Mass. — Cambridge Memories Inc. here has won Army and Navy contracts worth over \$2 million for replacement and extended memories of IBM 360 systems.

The two contracts represent the largest order of replacement and extended core memory ever from an independent supplier, CMI claims.

The U.S. Army contract, issued by the U.S. Army Computer Systems Support and Evaluation Command, will supply CMI's 360/Core add-on memories to 32 Model 30 computers.

The Army order is presently being protested by Computer Investors Group, which markets Data Recall memories.

Under terms of the Navy contract Cambridge Memories will supply 360/Core add-on units for six Navy 360 installations, including three Model 30s, two Model 40s and one Model 50.

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## Nickels & Dimes

The audit of Aries Corp. has been delayed, due primarily to a number of "unresolved matters relating to certain real estate holdings." But, the firm said, "substantial problems associated with continued losses in the company's computer software operations will remain."

\$\$\$

Clasco, formerly Computer Leasing and Systems Corp., compiled its first profitable year, with earnings of \$9,102 or 1 cent a share, for the period ended Dec. 31.

\$\$\$

Programming Methods set record revenues, earnings and earnings per share for the year ended Dec. 31. Revenues rose 74% to \$11.7 million, and earnings 40% to \$777,833, or 87 cents a share.

\$\$\$

Bunker Ramo has declared a quarterly dividend of 37.5 cents on preferred stock payable March 31 to stock-

holders of record March 15.

\$\$\$

Investment bankers Dryden and Co. has agreed to act as financial consultants for Computer Interactions for two years beginning May 1. Welles Capital, a related company, has agreed to purchase a substantial position in Computer Interactions common stock. The transactions are subject to stockholder approval.

\$\$\$

Data Instruments Co. has acquired CTC Computer Corp. for cash and stock, under a plan governing CTC's Chapter 11 proceedings. Data Instruments, itself a former member of Chapter 11, has agreed to pay CTC's bankruptcy expenses and up to \$300,000 for certain operating expenses and claims. Data Instruments said it will issue CTC up to 471,872 shares of common stock and agreed to assume CTC's obligation under a five-year note for \$400,000.

## Electronic Memories Loss Hits \$8.5 Million in '71

LOS ANGELES — Electronic Memories Magnetics Corp. almost had a turnaround from last year's loss of \$14.3 million, but an extraordinary charge of \$9.6 million brought an \$8.5 million loss for the year ended Dec. 31.

The firm earned about \$2 million on continuing operations, contrasted with last year's loss of \$10.2 million, and reduced losses from discontinued operations, to \$908,000 compared with \$3.1 million in 1970.

Revenues were \$75 million, down from \$75.4 million in 1970.

The extraordinary charge primarily consisted of the write-off of \$7.2 million in loans to Semiconductor Electronic Memories Inc., Phoenix, and the establishment of a valuation reserve of \$3.8 million against loans to Documentor Sciences Corp. and Zehntel Inc.

EM&M said it discontinued or sold portions involved in precision machine products, certain ferrite transformer cores, disk recording heads, welded electronic modules, magnetic separation equipment and electronic instrumentation products.

Memory products reached a sales level of about \$49 million,

accounting for 66% of total 1971 sales, up from 60% in 1970. Magnetic products sales decreased by about 12% to \$18 million, representing 24% of total sales compared with 1970's 27%.

Sales of electronic products also declined, about 22% from last year to \$7 million, accounting for 10% of total sales versus 13% in 1970.

EM&M reaffirmed its plans to shift its orientation from the original equipment manufacturers to include the end user. This transition "will require significant expenditures of funds and will impact earnings particularly during the first half of 1972," observed President Trude Taylor.

## Ampex Loss Now At \$86 Million

REDWOOD CITY, Calif. — Ampex Corp. has disclosed an \$86.3 million loss for the first three quarters of the year, and predicted a fourth quarter loss of about \$3 million, for a fiscal year loss of almost \$90 million. The third quarter loss was \$82.9 million.

Sales for the quarter ended Jan. 29 were \$54.3 million compared with \$83 million in 1970, when earnings totaled \$1.4 million, or 12 cents a share.

The nine-month loss compares with earnings of \$2.7 million, or 25 cents a share last year. Nine-month sales declined to \$209.6 million from \$221.9 million.

"The third quarter loss reflects adjustments which result in part from discontinued operations, provisions for contract settlements, unearned amounts under royalty guarantees, allowances for doubtful accounts, changes in lease accounting, inventory write-downs and other reserve and asset revaluations," Ampex said.

The first three quarters' loss as well as the projected loss reflect results of a special audit of the music division and an additional financial review of the total corporation by its outside auditing firm, Ampex continued.

## Redcor Files Chap. 11, Logic Reports Profit

WOODLAND HILLS, Calif. — Redcor Corp. has filed under Chapter 11, while another key-to-disk maker, Logic Corp., reported its first profitable year.

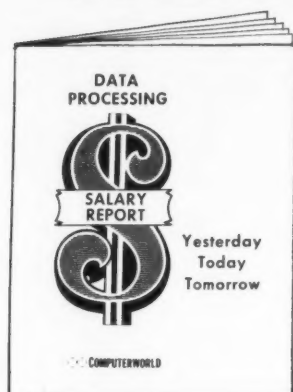
The only Redcor unit still in operation is Zeltex Corp., an electronic components manufacturer. The firm envisions a reorganization using Zeltex as a base of operations, attorney Jeff Chanin said.

Logic Corp. earned \$423,134, equal to 34 cents a share, in the year ended Dec. 31, compared with a loss of \$699,769, or 70 cents a share, last year.

Earnings included an extraordinary credit representing utilization of income tax loss carry-forward of \$200,000, or 16 cents per share.

Sales rose to \$3.3 million from \$626,030 in 1970.

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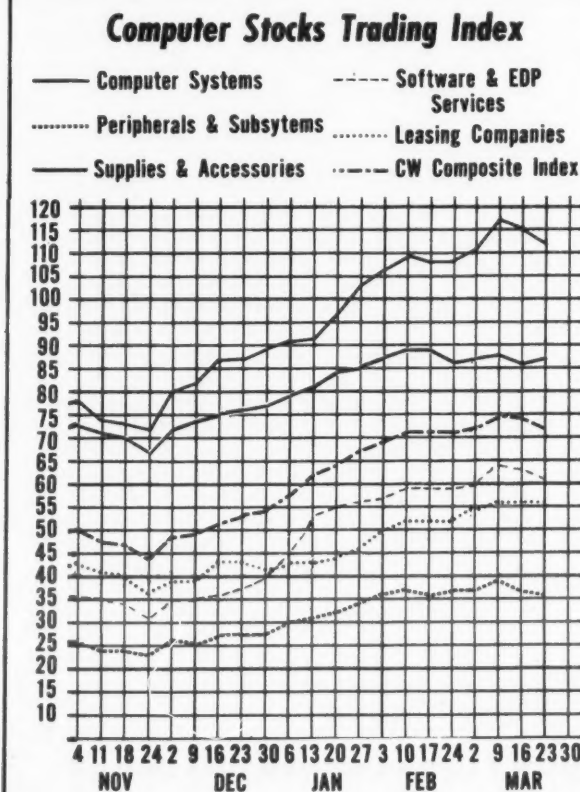
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E X C H		PRICE			
		71-72	CLOSE	WEEK	WEEK
		RANGE	MAR 23	NET	PCT
		(1)	1972	CHNGE	CHNGE
SOFTWARE & EDP SERVICES					
O	ADVANCED COMP TECH	1- 4	1 1/2	0	0.0
A	APPLIED DATA RES.	5- 13	5 3/8	0	0.0
O	APPLIED LOGIC	1- 3	2	- 1/4	-11.1
N	AUTOMATIC DATA PROC	44- 91	86 1/2	+ 1/2	+0.5
O	AUTO SCIENCES	1- 8	1 1/2	- 1/8	-20.0
O	COMPUTER DIMENSIONS	9- 17	10 3/4	-1 1/4	-10.4
O	COMPUTER NETWORK	2- 11	4 1/2	- 1/4	-5.2
N	COMPUTER SCIENCES	6- 17	10 1/4	+ 3/4	+7.8
O	COMPUTER TECHNOLOGY	4- 11	6	- 3/4	-11.1
O	COMPUTER USAGE	5- 16	12 1/8	+ 1/8	+1.0
O	COMP AUTOMOT REPORTS	6- 13	7	0	0.0
N	COMPUTING & SOFTWARE	17- 45	24 3/4	-1	-3.8
O	COMRESS	1- 4	2 3/8	- 3/8	-13.6
O	COMSHARE	4- 10	9 1/8	- 1/2	-5.1
O	DATA AUTOMATION	1- 4	1 1/2	+ 1/8	+33.3
O	DATA PACKAGING	6- 10	8 7/8	- 3/8	-4.0
O	DATAMATION SERVICE	1- 3	3/4	- 1/8	-14.2
L	DATATAB	3- 8	7 7/8	+ 3/8	+5.0
O	EDP RESOURCES	5- 16	5 1/4	- 3/4	-12.5
A	ELECT COMP PROG	2- 7	3 1/2	- 3/8	-9.6
N	ELECTRONIC DATA SYS.	34- 85	58 5/8	- 3/8	-0.6
O	INFORMATICS	6- 15	9	+ 1/2	+5.8
O	I.O.A. DATA CORP	1- 3	2 1/8	+ 1/8	+6.2
A	ITEL	7- 23	10 7/8	+ 5/8	+6.0
O	KEANE ASSOCIATES	4- 14	4 1/2	- 3/4	-14.2
O	KEYDATA CORP	5- 14	9	-1 1/8	-11.1
O	LOGICON	5- 8	7 7/8	- 1/4	-3.0
A	MANAGEMENT DATA	5- 11	8 3/8	+ 1/8	+1.5
O	NATIONAL CSS INC	7- 14	12 1/4	+ 1/4	+2.0
O	NAT COMP ANALYSTS	1- 4	5/8	- 1/8	-16.6
P	ON LINE SYSTEMS INC	7- 18	9 1/4	- 3/4	-7.5
N	PLANNING RESEARCH	10- 26	15 1/8	- 5/8	-3.9
O	PROGRAMMING METHODS	16- 29	23 1/4	- 1/2	-2.1
O	PROGRAMMING & SYS	1- 4	1 1/2	- 1/8	-7.6
O	SCIENTIFIC COMPUTERS	2- 4	3	- 1/8	-4.0
O	SIMPLICITY COMPUTER	1- 4	4 1/4	- 1/4	-5.5
O	SOFTWARE SYSTEMS	1- 3	1 3/8	0	0.0
O	TBS COMPUTER CENTERS	4- 9	5	0	0.0
O	TOLLEY INTL CORP	3- 8	10	- 3/4	-6.9
O	TRACOR COMPUTING	2- 5	1 3/4	0	0.0
O	TYMSHARE INC	4- 15	7 3/4	- 3/8	-4.6
O	UNITED DATA CENTER	2- 8	7	+ 1/4	+3.7
N	UNIVERSITY COMPUTING	14- 38	21 1/4	- 3/8	-1.7
A	URS SYSTEMS	5- 11	7 3/8	- 1/2	-6.3
O	VORTEX CORP	2- 6	5	0	0.0
PERIPHERALS & SUBSYSTEMS					
O	ADDRESSOGRAPH-MULT	24- 48	38 5/8	-1 1/8	-2.8
O	ALPHANUMERIC	1- 6	1 1/8	- 1/8	-10.0
N	AMPEX CORP	8- 25	8	- 1/2	-5.8
O	ANDERSON JACOBSON	5- 10	6	- 1/4	-4.0
O	ATLANTIC TECHNOLOGY	3- 9	6 1/2	-1 1/4	-16.1
A	BOLT, BERANEK & NEW	4- 13	13 1/4	+2 1/8	+19.1
N	BUNKER-RAMO	6- 17	11 1/2	+1	+9.5
A	CALCOMP	14- 33	21 3/4	+ 1/2	+2.3
O	COGNITRONICS	2- 9	3 1/4	- 1/8	-3.7
O	COMPUTER COMMUN.	5- 19	5 5/8	- 1/8	-2.1
A	COMPUTER EQUIPMENT	3- 7	3 3/4	- 1/8	-3.2
A	COMPUTEST	4- 20	7 1/4	- 1/4	-3.3
O	CONSOL COMPUTER LTD.	1- 12	1 1/2	0	0.0
A	DATA PRODUCTS CORP	3- 10	5 1/2	- 1/8	-2.2
O	DATA RECOGNITION	3- 8	4	0	0.0
O	DATA TECHNOLOGY	3- 9	3 1/2	0	0.0
O	DI/AN CONTROLS	3- 7	6	+ 3/4	+14.2
O	DIGITRONICS	2- 8	3 1/2	- 1/4	-6.6
N	ELECTRONIC M & M	5- 16	7 1/8	+ 1/2	+7.5
O	FABRI-TEK	2- 5	3 7/8	- 1/8	-3.1
O	GENERAL COMPUTER SYS	6- 16	12 3/4	-1 1/4	-8.9
N	GENERAL ELECTRIC	53-124	64 1/2	+1	+1.5
N	HAZELTINE CORP	6- 13	11 1/4	- 1/2	-4.2
O	INFOTEX INC	17- 49	32	-3	-8.5
O	INFORMATION DISPLAYS	3- 8	3 1/4	0	0.0
O	MANAGEMENT ASSIST	1- 2	1 1/4	- 1/8	-9.0
A	MARSHALL INDUSTRIES	7- 27	13	+ 7/8	+7.2
N	MEMOREX	20- 78	32	+2 3/4	+9.4
A	MILGO ELECTRONICS	12- 34	31 1/2	- 3/8	-1.1
N	MOHAWK DATA SCI	15- 47	25	+ 1/2	+2.0
O	OPTICAL SCANNING	6- 18	12	+ 1/2	+4.3
O	PERTEC CORP	9- 18	14 1/2	-1 1/4	-7.9
O	PHOTON	6- 15	13 1/8	- 7/8	-6.2
A	POTTER INSTRUMENT	11- 25	17 3/8	- 5/8	-3.4
O	PRECISION INST.	7- 16	8	- 1/4	-3.0
O	RECOGNITION EQUIP	9- 26	10 1/4	- 3/4	-6.8
O	REDCOR CORP.	1- 9	1 1/8	0	0.0
N	SANDERS ASSOCIATES	9- 22	20 1/8	+ 3/8	+1.8
O	SCAN DATA	6- 15	10 1/4	-1 1/4	-10.8
O	SYCOR INC	3- 11	8 1/4	- 1/4	-2.9
O	TALLY CORP.	6- 16	10 1/4	+ 3/8	+3.7
N	TEKTRONIX INC	28- 45	43 3/4	+ 1/8	+0.2
N	TELEX	8- 22	12 7/8	+ 1/2	+4.0
SUPPLIES & ACCESSORIES					
N	ADAMS-MILLIS CORP	9- 19	10 3/8	- 1/4	-2.3
O	BALTIMORE BUS FORMS	6- 10	6 1/2	0	0.0
A	BARRY WRIGHT	7- 13	11	0	0.0
A	DATA DOCUMENTS	14- 29	23	- 5/8	-2.6
O	DUPLEX PRODUCTS INC	8- 14	14 1/8	+ 5/8	+4.6
N	ENNIS BUS. FORMS	5- 13	8 1/8	+ 1/4	+3.1
O	GRAHAM MAGNETICS	9- 35	22 1/4	-1 1/4	-5.3



## Earnings Reports

### COMPUTER COMMUNICATIONS

		1971	a1970
Shr Ernd	b\$.01	.....	.....
Revenue	2,554,577	\$864,980	.....
Loss Disc	.....	338,877	.....
Op	.....	c85,414	.....
Spec Cred	.....	.....	.....
Earnings	e101,102	(871,859)	.....
6 Mo Rev	3,526,379	1,727,582	.....
Loss Disc	.....	.....	.....
Op	.....	424,922	.....
Spec Cred	39,469	.....	.....
Loss	526,487	1,406,628	.....

a-Restated. b-Based on income before special credit. c-From sale of subsidiary. e-Equal to 6 cents a share.

### COMPUTER SCIENCES

		1971	1970
Shr Ernd	\$.09	\$.09	.....
Revenue	30,566,000	30,222,000	.....
Earnings	1,225,000	1,130,000	.....
9 Mo Shr	.28	.28	.....
Revenue	a96,510,000	83,005,000	.....
Earnings	3,710,000	3,649,000	.....

a-Includes \$7,200,000 from the sale of Computax in 1971.

### ELDERADO ELECTRODATA

		1972	1971
Shr Ernd	\$.12	\$.08	.....
Revenue	1,677,617	995,748	.....
Earnings	112,530	76,600	.....
9 Mo Shr	.12	.11	.....
Revenue	3,609,067	2,610,435	.....
Earnings	114,094	94,747	.....





EPOCH 4

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with a 20-year warranty.**



GRAHAM, TEXAS 76046